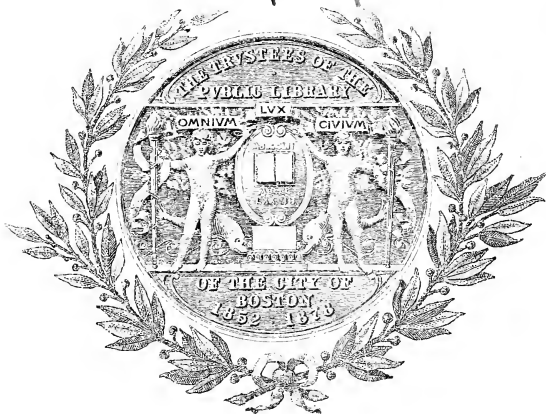



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A MANUAL OF INSTRUCTION
FOR
ATTENDANTS
ON
SICK AND WOUNDED IN WAR.

ILLUSTRATED WITH NUMEROUS WOODCUTS.

BY

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P R E F A C E.

THE following pages, taken from a course of instruction originally prepared for the training of the Army Hospital Corps, I am not without hope, will be found serviceable by all who are anxious to help in the great and humane work of the "National Society for Aid to Sick and Wounded."

In the text, I have endeavoured, as far as possible, to avoid technical language, and to express myself so as to be understood by every class of reader.

For the many mistakes in the work, I must offer as an excuse the haste with which the sheets have been hurried through the press, from a desire to meet the present emergency.

I am indebted to numerous friends for assistance

and suggestions ; and especially to Professor Longmore, of whose "Treatise on the Transport of Sick and Wounded" I have made such free use ; also to Mr. Berkeley Hill, Mr. Christopher Heath, and others, whose works I have consulted.

A. MOFFITT.

Netley, 28th September, 1870.

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A
MANUAL OF INSTRUCTION

FOR

ATTENDANTS ON SICK AND WOUNDED IN WAR.



CHAPTER I.

THE ANATOMY OF THE HUMAN BODY.

THE BONES OF THE BODY.

THE bones of the body are 242 in number. They are jointed or articulated with each other in such a manner as to form a framework, which is called a skeleton. The bones determine the general shape and proportions of the body, give attachment to the muscles, and form levers on which the muscles act to move the body from one position to another. They also form cavities for containing important organs.

The skeleton may be divided for description into the head, the trunk, and the upper and lower extremities.

The bones of the head include those of the skull and face, the more important of which are the following:—

Cranium, the Skull.—The cranium is made up of eight pieces, intimately united together, and forming a strong bony case for the protection of the brain. In front is the

frontal bone, behind is the *occipital* bone, at the sides are the two *temporal* bones, above and at the sides are the *parietal* bones, and forming the base are the *sphenoid* and *ethmoid* bones.

The frontal bone, in connection with the temporal, sphenoid, and the bones of the face, form sockets for the eyes.

The temporal bones contain the apparatus for hearing, protected in strong bony canals. The occipital bone is articulated to the spinal column, and here has a hole through which the spinal cord passes from the brain into the canal in the spinal column.

Superior Maxilla, the Upper Jaw.—The upper jaw constitutes the greater part of the face, and enters into the formation of the eye-sockets and nasal cavities. It is fixed and firmly united to the bones of the skull and the other bones of the face, and contains the upper row of teeth.

Inferior Maxilla, the Lower Jaw.—The lower jaw is horseshoe shaped, and forms the chin and lower part of the face. It contains the lower row of teeth, and is moveable for the purpose of mastication.

Malar Bone, the Cheek Bone.—This is a small bone, placed at each side of the face, and forming the cheek. It enters into the formation of the orbit.

Nasal Bones, the Bones of the Nose.—These are two small bones, forming the bridge of the nose.

The *Bones of the Trunk* are the following:—

Vertebræ, Bones of the Spine.—The spine is made up of a number of pieces, each called a vertebra. These are divided into three portions, the cervical, seven in number, in the neck; the dorsal, twelve in number, in the back; and the lumbar, five in number, in the loins. The vertebræ form a column to preserve the erect position of the

body, and a bony canal for the protection of the spinal cord.

Costæ, the Ribs.—The ribs are twelve in number on each side, and are divided into seven true and five false. They are articulated to the dorsal vertebræ behind, and attached to the sternum in front by cartilages. The true ribs are more liable to fracture than the false ribs, being less yielding.

Sternum, the Breast Bone.—This is a flat bone placed in the front of the chest. At each side it has attached to it the cartilages of the ribs, and at its upper end it has articulated to it the clavicles. The sternum with the ribs and dorsal vertebræ forms the chest or thorax.

Sacrum, the Rump Bone.—This bone forms the lower end of the spinal column, and is continuous with the vertebræ. It forms the back part of the pelvis, and articulates above with the last lumbar vertebra, at the sides with the nameless bones, and has attached to it below a small string of bones called the coccyx. It is curved, with the concave side forwards, and following this curve runs the rectum, or lower part of the great gut.

Ossa Innominata, the nameless bones.—These are two bones of irregular shape, one on each side, forming the sides and front of the pelvis. They are attached to the sides of the sacrum behind, and to each other in front. Each is made up of three parts, the *ilium*, the *ischium*, and the *pubis*.

The two nameless bones, with the sacrum and coccyx, form the basin-shaped cavity at the lower part of the trunk, called the pelvis.

The bones of the upper extremity are the following:—

Clavicle, the Collar Bone.—The clavicle is a bone placed on each side at the upper part of the chest. Its inner end

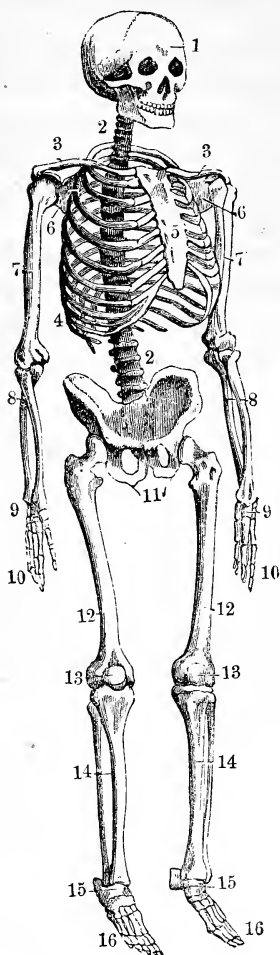


FIG. 1.

SKELETON OF HUMAN BODY.

1. Cranium, or skull.
2. Spine formed of vertebræ.
3. Clavicle, or collar-bone.
4. Costæ, or ribs.
5. Sternum, or breast-bone.
6. Scapula, or shoulder-blade.
7. Humerus, or arm-bone.
8. Radius and ulna.
9. Carpal bones.
10. Phalanges, or finger-bones.
11. Pelvis.
12. Femur, or thigh-bone.
13. Patella, or knee-cap.
14. Tibia and fibula.
15. Tarsal bones.
16. Metatarsal bones and phalanges.

is articulated to the sternum, and its outer to the scapula. Its use is to support the shoulder, and keep it out from the chest.

Scapula, the Shoulder-blade.—This is a flat bone of triangular form, placed at the back of the shoulder. On its outer surface runs a ridge which divides it into two unequal portions. The scapula is attached to the spinal column and ribs by strong muscles, and articulates at its upper and outer angle with the clavicle and with the humerus.

Humerus, the Bone of Upper Arm.—This is a long bone, having at its upper end a rounded head, which articulates with the scapula, and at its lower end a grooved surface, which, with the bones of the forearm, forms the elbow joint.

Radius, the outer Bone of Forearm.—This is a long cylindrical bone, articulating above with the humerus, and having at its lower end the bones of the wrist.

Ulna, the inner Bone of Forearm.—This is a long, irregularly shaped bone, articulating above with the humerus, and below with the radius. At its upper end is a projection, which forms the point of the elbow. This projection is called the olecranon, and gives attachment to muscles coming from above. The space between the radius and the ulna is called the interosseous space.

Carpus, the Wrist Bones.—The carpus is a collection of small bones of irregular shape, eight in number, articulating with the radius above, with each other, and with the heads of the bones below. They are thus numerous in order to give greater mobility or play to the wrist joint.

The Metacarpal Bones, the Bones of the Hand.—These are five in number, corresponding with the number of the thumb and fingers, to each of which one belongs. They articulate above with the carpus, and below with the first

bones of the thumb and fingers. The whole together form the palm of the hand and ball of the thumb.

Phalanges, the Bones of the Thumb and Fingers.—These are fourteen in number, and are disposed two to the thumb, and three to each of the fingers.

The bones of the lower extremity are the following :—

Femur, the Thigh Bone.—This is a long bone of cylindrical form. Its upper end is rounded and forms a ball and socket joint with the nameless bone. On its upper end is a large protuberance, called the *great trochanter*, for the attachment of muscles. At its lower end the femur enters into the formation of the knee joint.

Patella, the Knee-Cap.—This is a small irregularly oval bone, roughened on its front surface for the attachment of tendons of muscles, and smooth on its inner surface where it works over the lower end of the femur like a cord in the groove of a pulley. It protects the knee-joint from injury.

Tibia, the Shin Bone.—The Tibia is the larger of the two bones of the leg and is situated on the inner and front part of the limb. It is sharp-edged in front, and being there covered only by the skin, is very often injured by blows or knocks against hard substances. The tibia enters into the formation of the knee-joint above, and of the ankle joint below. On its lower end is a prominence called the *internal malleolus*.

Fibula, the outer Bone of the Leg.—This is smaller than the tibia, and is situated on the outer side of the limb. At its upper end it is articulated to the tibia. At its lower end it is also articulated to the tibia, and enters into the formation of the ankle joint. On its lower end is a prominence called the *external malleolus*.

Tarsus, the Ankle Bones.—The bones of the ankle are seven in number, of various irregular forms, each articu-

lating with the one next to it. The upper one articulates with the tibia and fibula to form the ankle joint; the lowermost four articulate with the bones of the foot. One of the tarsal bones projects backwards to form the heel, and acts as a lever for the attachment of muscles to move the foot. This projecting bone is called the *calcaneum*.

Metatarsal Bones, the Bones of the Foot.—These are five in number, and form the broad part of the foot. Above they articulate with the four lowermost bones of the tarsus. Below they articulate with the bones of the toes.

Phalanges, the Bones of the Toes.—These are fourteen in number as in the hand, and are disposed in a similar manner, viz., two to the great toe, and three to each of the others.

THE MUSCLES OF THE BODY.

The muscles constitute the flesh or lean part of meat. They surround the bones and make up the great mass of the body. Muscles are made up of fibres, which have been divided into two classes, striped and unstriped. The former obey the will and are called voluntary, the latter are not subject to the will, and are called involuntary. The voluntary muscles are found round the bones of the body, the involuntary in the muscular layer of the stomach, intestines, &c.

“By the action of the nervous system, acting through the will or otherwise, the masses of flesh, called muscles, are made to contract or shorten themselves, and by this contraction or shortening, the levers to which they are attached, are made to approach or recede from each other. The whole phenomena of locomotion, of muscular action generally, and of the voice, depend upon this single phenomenon, the contraction or shortening of muscular fibre,

under the influence of the will, or when acted upon by excitants."

THE HEART AND BLOODVESSELS.

The apparatus for the circulation of the blood comprises the heart, the arteries, and the veins.

The Heart.—The heart is a hollow muscular organ placed in the left side of the chest. When natural it is about the size of the fist of the person to whom it belongs. It is covered on its outside by a smooth serous membrane, and fixed in a fibrous bag lined with the same; which arrangement allows the heart to move freely without impediment.

It is made up of four cavities, two auricles and two ventricles. These are arranged, an auricle and a ventricle, one above the other, on the right side, and an auricle and a ventricle on the left side. The auricle and ventricle of each side communicate directly with each other, but have no direct communication with the auricle and ventricle of the other side. The two ventricles form the front and lower part of the heart, while the two auricles form the back and upper part.

One set of vessels, called veins, proceed to the heart and empty their contents into the auricles; another set or vessels, called arteries, proceed from the heart and come from the ventricles.

Arteries.—These, as has been stated, proceed from the ventricles of the heart. They are plain elastic tubes, which divide and give off branches to the various parts of the body, and terminate in tubes, called capillaries, so small that they cannot be seen by the naked eye. Arteries carry red pure blood from the heart, with the exception of the pulmonary artery, which carries dark venous blood. All arteries are continuations, or branches, of two great arteries—namely, the pulmonary artery, and the aorta.

The Pulmonary Artery.—This arises from the *right* ventricle of the heart, proceeds upwards for about an inch and a quarter, and divides into two branches. These are named the right and left pulmonary arteries.

The right passes into the right lung, the left into the left lung.

The pulmonary artery, as it leaves the ventricle of the heart, is furnished with three valves, which allow the blood to be propelled from the heart, but prevent its returning.

The right and left pulmonary arteries when they enter the lungs divide into innumerable branches, which form a fine network of vessels on the walls of the air-cells.

The pulmonary artery is unlike all other arteries in that it comes from the right side of the heart, and carries dark venous blood.

The Aorta rises from the *left* ventricle of the heart, in front of the auricle. It first proceeds upwards, then curves over towards the left side of the spine, along which it descends behind the midriff into the abdomen, until it reaches the fourth lumbar vertebra. Here it divides into two branches, called the right and left common iliac arteries.

The curved part of the aorta near the heart is called the arch, that part which is in the chest the thoracic aorta, and the part in the belly the abdominal aorta.

The commencement of the aorta, like the pulmonary artery, is furnished with three valves, which prevent the blood returning to the heart.

In its course the aorta gives off a number of branches, the principal of which will now be described.

Arteria Innominata, the nameless artery.—This arises from the arch of the aorta on a level with the second rib. From its origin it proceeds upwards to terminate behind the

joint of the sternum and clavicle on the right side. Here it divides into the right carotid and right subclavian arteries. It is a short thick trunk, varying from an inch to an inch and a half in length.

The Common Carotid Arteries.—On the right side, as has been stated, the common carotid is a branch of the nameless artery. On the left side it arises from the arch of the aorta. They ascend in the neck, one on each side of the windpipe, and terminate about an inch below the angle of the lower jaw. Each here divides into two branches, called the internal and external carotid arteries. In their course they lie close to the spine, which thus presents a hard substance, against which they can be pressed to stop bleeding. In front they are near the surface, and can be felt throbbing at either side of the windpipe.

The deep jugular vein lies on the outer side of the carotid artery.

Internal Carotid Artery.—This is a branch of the common carotid. It ascends deep in the neck to a hole in the base of the skull, and there entering, distributes its branches to the brain and its membranes.

External Carotid Artery.—This is the outer branch of the common carotid. It runs up towards the ear, behind the angle of the jaw, and gives off branches to the parts about the windpipe, the tongue, the teeth, and the back and side of the head. The *facial* branch runs over the lower jaw, and goes to supply the lips and face; the *occipital* branch runs round the back of the head, and supplies the parts thereabouts; and the *temporal* branch, running upwards in front of the ear, over the temple, where it may be felt throbbing, divides into a number of branches.

The Subclavian Artery.—On the right side this is a

branch of the nameless artery, but on the left it rises from the aorta. It runs outwards, crosses the first rib, which it grooves, and passes behind the clavicle into the upper part of the axilla, or armpit. In its course it can easily be pressed, behind the middle of the clavicle, against the first rib. The subclavian vein lies in front of this artery.

The Axillary Artery.—This is a continuation of the subclavian. It descends across the armpit until it reaches the inside of the arm. In this course it is very near the surface, and gives off a number of small branches to the side of the chest. It is accompanied by the axillary vein.

The Brachial Artery.—This is a continuation of the axillary. It commences at the lower part of the armpit, passing downwards and forwards until it reaches the front of the elbow joint. Here it divides into two branches.

In its course it is accompanied by two large veins.

At the upper part of the arm it lies on the inner side of the bone, and is very near the surface. This part is therefore selected for compressing the artery either by hand or tourniquet.

The Radial Artery.—This is the smaller branch of the brachial. It runs downward from the bend of the elbow, along the radius, to the wrist. It here winds outwards towards the back of the joint, and sinking into the space between the metacarpal bones of the thumb and fore-finger, enters the palm of the hand, and forms what is called the deep palmar arch. It is accompanied by two veins.

In the upper part of its course the radial artery is deep-seated. Approaching the wrist it is near the surface: and this is the point selected for feeling the pulse.

The Ulnar Artery.—This is the large branch of the brachial. It descends along the ulnar side of the forearm, passes over the wrist, and enters the palm of the hand,

which it crosses, and ends by forming what is called the superficial palmar arch. At the upper part of its course it

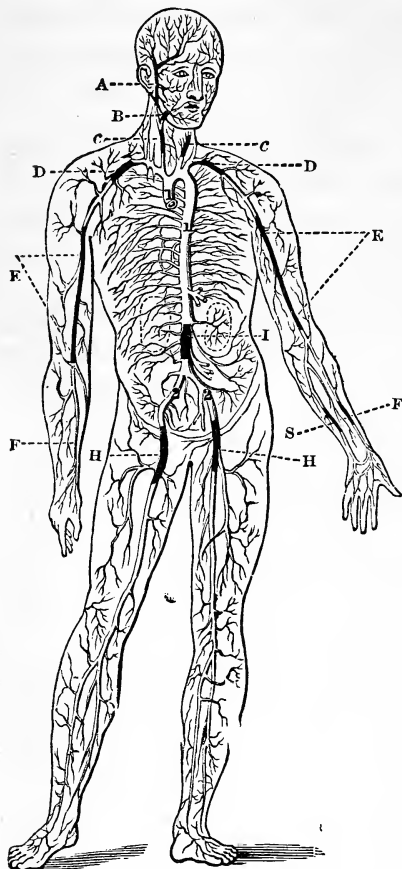


FIG. 2.

ARTERIES OF THE BODY.

1. Thoracic Aorta.
 2. Iliac arteries.
- A. External carotid.
 B. Internal carotid.
 C. Common carotid.
 D. Subclavian artery.
 E. Brachial artery.
 F. Radial artery.
 H. Femoral artery.
 I. Abdominal aorta.
 S. Ulnar artery.

is deep, at the wrist it is near the surface, and can be felt throbbing on the lower part of the ulna. The palmar arch gives off branches to the fingers, called digital arteries.

The Common Iliac Arteries.—The aorta, after giving off innumerable branches to the organs of the chest and abdomen, divides at about the fourth lumbar vertebra into the right and left common iliaes. Each of these proceeds outwards towards the brim of the pelvis, and divides into two branches, called the internal and external iliaes.

Each common iliac has a large accompanying vein.

Internal Iliac Artery.—This is the inner branch of the common iliac. It runs down into the cavity of the pelvis, gives off branches for the supply of the various organs therein, and the large mass of muscles forming the buttocks. It has one accompanying vein.

External Iliac Artery.—This arises in common with the last-named artery, runs along the brim of the pelvis, and passes out of the abdomen about the middle of the groin. It has a large accompanying vein on its inner side.

Femoral Artery.—This is a continuation of the external iliac. It commences where the artery passes out of the abdomen in the groin, whence it descends in the thigh, winding round the inside of the femur, until it gets into the ham at the back of the knee joint, where it becomes the popliteal.

On its inner side runs a large accompanying vein.

At the groin and upper part of the thigh the artery is near the surface, and has behind it the pubis above, and femur lower down, against either of which it can be pressed.

Popliteal Artery.—This is a continuation of the femoral. It runs from the upper to the lower part of the popliteal space at the back of the knee joint. A little below the knee it divides into two branches, called the anterior and posterior tibials. Its corresponding vein lies close behind it.

The Anterior Tibial Artery is a branch of the popliteal.

It passes forward between the tibia and fibula to the front of the leg, and runs downwards on the outer side of the shin-bone, over the instep of the foot, towards the division between the great and next toe. In the upper part of the leg it is deep, but in the lower part, and on the instep of the foot, it is near the surface, and can be felt throbbing. On the upper part of the foot it is called the *dorsal* artery. It has two corresponding veins.

The Posterior Tibial Artery.—This arises, in common with the anterior tibial, from the popliteal. It runs downwards along the back of the tibia, and winds round the inner ankle into the sole of the foot. Here it divides into two branches, called the *plantar* arteries, which run forwards through the sole of the foot to supply the toes. Near its origin it gives off a large branch to the outside of the leg, called the peroneal. The posterior tibial has two corresponding veins.

The Peroneal or Fibular Artery.—This artery, arising from the posterior tibial, descends along the back part of the fibula, and terminates at the outer ankle.

Like the other arteries of the leg it has two corresponding veins.

Veins are tubes furnished generally with valves. They commence by small vessels, called capillaries. These, by uniting with each other, soon form branches, and these running into each other form large vessels proceeding towards the heart.

Veins may be divided into two sets of vessels, the superficial and the deep-seated. The superficial run close under the skin, and may readily be seen, especially if pressure be made to prevent the blood passing towards the heart.

Some of these superficial veins receive special names.

In the upper extremity a vein which runs up the centre of the forearm is called the *median*, one on the inside of the arm the *basilic*, and one on the outside of the arm the *cephalic*. In the lower extremity a large vein runs up the inner side of the limb from the ankle to the upper part of the thigh, and is called the *saphena*, and in the neck at each side is a vein called the *external jugular*.

The deep-seated veins generally accompany arteries, either one or two to each artery, and, as a rule, take the names of the artery with which they run. Some, however, receive special names, as the *venæ cavæ*, the internal jugulars, &c.

Veins carry dark, impure blood towards the heart, with the exception of the pulmonary veins, which carry red, pure blood from the lungs to the heart.

Circulation of the Blood.—The right auricle of the heart receives the dark, venous blood from the veins, and discharges it into the right ventricle. The right ventricle, as soon as it is full of blood, contracts, and propels it through the pulmonary artery into the lungs. The blood is here distributed in the network of arteries on the cell walls, and by the action of the air breathed into the lungs is oxidized and changed from impure, dark, venous blood into pure, bright red, arterial blood. Being thus changed, it is conveyed from the lungs by the pulmonary veins to the left auricle. This discharges it into the left ventricle, which, as soon as it is full, contracts, and propels the blood into the aorta, and thence by its numerous branches it is distributed throughout the whole body.

The blood having nourished the various parts of the body, and having become impure and dark in colour, is now conveyed back to the right auricle of the heart by the veins.

The cavities of the heart in a healthy man contract between seventy and seventy-five times in a minute ; and the pulse is caused by the contraction of the left ventricle and the propulsion of the blood through the arteries.

THE NERVOUS SYSTEM.

“ The nervous system is divisible into two chief portions, a centre and a periphery. The centre is composed of the brain and spinal marrow ; the periphery of the nerves. But this latter may be subdivided further into two portions, namely, cerebro-spinal nerves and sympathetic nerves ; the former in direct communication with the brain and spinal marrow ; the latter indirectly connected with these.”

The brain is one of the most important and delicate organs in the body. It is protected by a bony case, the cranium, enveloped by membranes, and bathed with fluid. In connection with the brain nine pairs of nerves are given off ; these are called cranial nerves.

The spinal marrow runs from the brain along the bony canal in the spinal column as far as the loins. Like the brain it is enveloped in membranes, and bathed with fluid. From each side of it the spinal nerves proceed to the various parts of the body.

The cerebro-spinal nerves arise from the brain and spinal marrow. They present the appearance of white cords. These divide and communicate freely with each other, and at last terminate in the organs by loops.

The sympathetic system of nerves is a series of ganglions, or knots, connected with each other, and arranged along the front and sides of the spinal column. These ganglions, or knots, give off filaments to connect them with the cerebro-spinal nerves, and to accompany arteries and veins.

The sympathetic system of nerves is said to preside over the nutrition of the body, the secretions, excretions, &c.

THE IMPORTANT ORGANS OF THE BODY.

The lungs are two spongy, cellular masses, contained within the cavity of the thorax, or chest, one on the right, the other on the left side. They are each covered with a smooth membrane called the pleura, which is continued from them to line the inside of the chest walls. This arrangement allows a free gliding motion to take place between the lungs and chest walls.

The structure of the lungs is made up of branches of the bronchial tubes, air cells, arteries, veins, and nerves.

The object of the function of the lungs is to expose the venous blood to the action of the air during its passage through them, and by its means to convert it into arterial blood.

The passage of air to the lungs is by the windpipe and bronchial tubes. The windpipe commences at the back of the mouth, at a part called the fauces, and descends in front of the gullet and spinal column. The upper part is called the *larynx*, and contains the apparatus for forming the voice; the lower part is called the *trachea*. The trachea at its lower end divides into two branches, one going to the right lung, the other to the left; these are called the *bronchial tubes*.

The stomach is a musculo-membranous bag, situated immediately below the diaphragm, in the upper centre and left part of the abdomen. It is for the reception of food and drink, and is lined with mucous membrane, which secretes the gastric juice to aid in digestion. The opening into it from the mouth is by a musculo-membranous tube

called the *œsophagus*, or gullet, having at its upper end, communicating with the mouth, a pouch somewhat of a funnel shape, called the *pharynx*. From the stomach leads the small intestine.

The intestine is a tube leading from the stomach to the anus, and is divided into two parts—the small and the large intestine. These are mostly convoluted upon themselves, the former, however, much more so than the latter. They are lined throughout with mucous membrane, which is continuous with that of the stomach. The small intestine contains a number of glands which form secretions to aid in digestion. The coats of the intestines, besides blood-vessels and nerves, contain a great number of absorbent vessels, for the purpose of taking up the nutritious portion of the food (called chyle) and conveying it into the circulation, to be converted into fresh blood for the nourishment of the body.

The ducts from the gall-bladder and the pancreas open into the small intestine a short distance from the stomach.

The lower part of the large intestine is called the *rectum*, and the external opening from it the *anus*.

The liver is a large body placed immediately below the midriff, and extending round under the cartilages of the ribs on the right side as far back as the spine. On its lower surface is a bag called the gall-bladder, for storing up the secretion from it, and from this bag a tube leads out into the small intestine at a short distance from the stomach. The secretion from the liver is called bile.

The spleen is a solid vascular organ, situated in the abdomen below the midriff, under the cartilages of the false ribs on the left side. The use of the spleen is not known; it has no duct leading from it.

The pancreas is a solid body of a greyish white colour, lying across the spinal column at the back of the stomach. It secretes a fluid which aids in digestion, and which it discharges into the small intestine near the stomach, sometimes by a duct of its own and sometimes by uniting with the bile duct from the gall-bladder.

The Kidneys and their Appendages.—The kidneys are two solid dark red bodies, situated in the loins, one on each side of the spinal column, enveloped in fat. The left is situated somewhat higher than the right, and is usually the larger of the two. They are supplied by a large artery each, and are for the purpose of secreting the urine. From each kidney to the bladder a tube runs which conveys the urine, as it is secreted, from the kidney to the bladder. Above the kidneys are placed two small bodies called the supra-renal capsules. Their use is not known.

The bladder is a bag situated in the cavity of the pelvis for the reception and accumulation of the urine previously to its being ejected from the body. When full it rises somewhat above the front of the pelvis (the pubis), and may be felt by the hand. The urine enters from the kidneys by two tubes called the *ureters*, and is discharged by a tube leading from the bladder through the penis, which is called the *urethra*.

CHAPTER II.

BANDAGES AND BANDAGING.

BANDAGES may be divided into two classes—*roller* bandages and *special* or *compound* bandages. The former alone will be considered in the following general remarks.

Texture of Bandages.—Bandages are made of unbleached calico, flannel, or silk, torn or woven into strips, which vary in breadth and length according to the part for which they are required.

Breadth and Length.—For the fingers the breadth is about three quarters of an inch, for the head and upper extremity two and a half inches, and for the body and lower extremity three inches. For the fingers the length is from a yard to a yard and a half, for the head and upper extremity three to six yards, for the lower extremity and body six to eight yards.

Rolling a Bandage.—Before applying a bandage it is necessary that it should be neatly and firmly rolled. It is rolled either with a single head or a double head.

To roll a Bandage with a Single Head.—One end of the bandage, being folded four or five times upon itself, is made into a small roll, which is seized by the fingers of both hands, one end placed opposite the division between the first and middle fingers of each hand, and both thumbs placed on the top of it; while the unrolled bandage, coming from the upper side of the roll over the fingers, is spread

out on the floor in front of the person about to roll it. The thumbs now, by an alternate movement, make the roll revolve inwards on its own axis, while the fingers hold it fixed in position between the two hands. (See fig. 3).

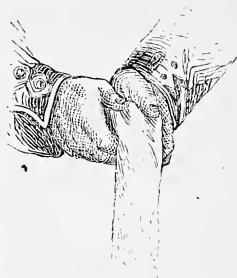


FIG. 3.

This movement is continued until the whole of the bandage is wound tightly and evenly round the original roll. The end should then be fastened by a stitch, pin, or thread, to prevent it unrolling.

To roll a Bandage with a Double Head.—The bandage should first be marked at its centre, rolled from one end to this mark and fastened, and then rolled in like manner from the other end.

Application of a Single-headed Bandage.—The bandage is held in the right hand, with its axis across the palm and the free end towards the fingers. The free end is then taken between the finger and thumb of the left hand and laid on a point of the circumference of the part about to receive the bandage, the outer side of the roll towards the part on which it is to be applied; and being here fixed, the application of the bandage is continued in the direction desired. It is customary to bandage from the inside of the limb in all cases, but as this necessitates the power of using both hands equally well, attendants will find it more convenient to bandage from left to right over the limb, the left hand taking hold of the bandage underneath and carrying it up to meet the right.

When the bandage is exhausted the terminal end is folded once inwards on itself and fixed either by stitches, pins, or tearing it into two strips, which are carried in

opposite directions round the limb and knotted together. When pins are employed they should be directed parallel to the length of the bandage, entered from the free end, and their points concealed beneath the bandage, care being taken not to prick the patient. Tearing a bandage is an untidy proceeding.

Position of the Patient and Limb.—When about to apply a bandage the patient should be placed either lying down or sitting, the limb raised and placed in that position, whether straight or bent, which it is intended to occupy when the bandaging is completed, and so supported by an assistant.

Position of Bandager and Assistant.—The bandager should place himself opposite the limb to be bandaged, either standing or sitting as may be most convenient. The assistant's position is at the side of the limb, which he should support with both hands.

Turns of a Bandage.—In bandaging a limb, owing to the irregular increase of the circumference, it is necessary, in order to support the parts evenly and prevent undue pressure at any given point, to employ a variety of turns. At the joints—the ankle, knee, elbow, &c.,—especially when they are bent, the *crucial* or *figure of 8* is used. On parts where the limb is of nearly uniform thickness, as above the ankle, below the knee, and on portions of the arm, the *simple spiral* is employed. On those parts where the circumference increases, to prevent the bandage bagging at the lower edge of the folds, the *reverse spiral* is had recourse to.

The Crucial, or Figure of 8.—The crucial bandage is that formed by crossing the turns of the bandage one over the other, so as to represent the figure 8. It is generally employed at the bends of joints, and where the increase in size of a part is too great and sudden for the reverse spiral

to effect the close fitting of the bandage. It is always used when carrying a bandage over the ankle joint. The end of the bandage is first made fast, then carried over the upper part or instep of the foot, down under and across the sole, up and over the instep again, and lastly round above the heel, and so repeated as often as is necessary to cover the part.

The simple spiral covers the part to which it is applied by turns, each of which overlaps the preceding one to the extent of from one-half to two-thirds of the width of the bandage employed, and proceeds regularly and spirally round and round the part. (See fig. 4.)

The reverse spiral is like the former, except that the bandage is turned back upon itself each time as it is carried round the limb.

Making a reverse turn of a bandage is always attended with some difficulty to a beginner, and requires considerable practice before it can be accomplished with facility.

The thumb or fore-finger of the left hand should be placed upon the upper border at the part where the turn is to be commenced, while the right hand turns the bandage back upon itself so as to make the fold pass obliquely across the bandage. When the thumb or finger has fixed the upper border, the bandage in the right hand should be held quite slack, and the reverse will thus be made with much greater facility than if held tightly.

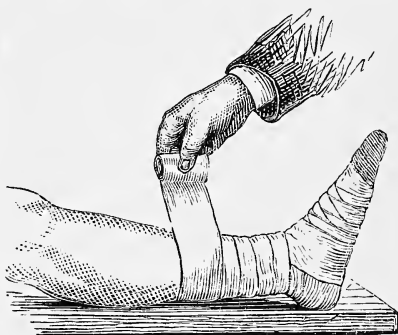


FIG. 4.

The reverses should, if possible, be at the side of a limb,

on the soft muscular part, and not over a prominent bone, such as the shin-bone, as they may cause uneven and undue pressure on such parts, which it is well to avoid. (See fig. 5.)

Application of a Double-headed Bandage.—One head of the bandage being taken in each hand, the intermediate portion is applied to the part, and the heads carried round the sides until they meet at the opposite to that of departure. At the point of meeting, the heads are changed from one hand to the

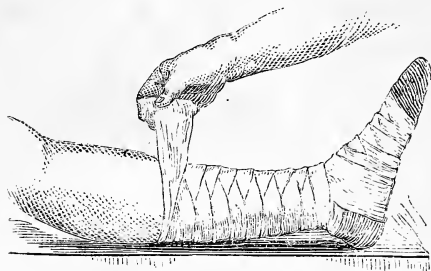


FIG. 5.

other, and thus crossed, are carried forward, where they again change hands, this movement being continued as often as is necessary. The terminal ends are fastened in the ordinary manner.

Bandages for the head and face are the following, viz.,—

The Circular Bandage.—To apply this a single-headed roller, commencing on the forehead, is carried round the head immediately above the ears, and being fastened with a pin at the point where it commenced, is varied in its course upwards or downwards, so as to pass over the spot where it is necessary either to retain dressings or make pressure. To prevent the circular turns slipping upwards over the top of the head, the bandage is fastened at one side over the temple by a pin or stitch, brought down under the chin and fastened over the temple on the opposite side. (See fig. 6.)

This bandage cannot well be employed for any part of

the top of the head, but will answer to retain a dressing or compress either on the front, side, or back of it.

Knotted Bandage. — This bandage is employed, when it is necessary to make pressure, for the purpose of arresting hæmorrhage from a wound on the side of the head.

A compress being laid upon the wound, one head of a double-headed roller is taken in each hand, and the part of it between the two heads placed over the compress. This done, the ends are carried horizontally round the head, and being crossed at the opposite side, one is carried under the chin while the other is brought over the top of the head to the point of starting. Here, over the compress, the ends of the bandage are crossed and carried again horizontally round the head to the opposite side, thence under the chin and over the top of the head to the point of starting, and so on as often as may be required. (See fig. 7.)

Capeline Bandage.—This bandage is employed where it



FIG. 6.



FIG. 7.

is necessary to retain dressings, a blister, or an ice-bag on the head.

To apply it, one head of a double-headed roller being taken in each hand, the middle is laid on the forehead and the ends carried round the temples, above the ears, to the back of the head. Here they are crossed, one being continued horizontally round the head, and the other, the undermost one, brought straight over the top of the head to the forehead, where it is crossed and bound down by the horizontal turn. Thence it is taken back, over the top of the head, by the side of and partly overlapping that already



FIG. 8.

applied, to the back of the head, where it is again crossed and bound down by the horizontal turn. This is repeated backwards and forwards, each succeeding fold being placed nearer to the sides of the head, until it is quite covered, when the ends are secured by a pin or stitch. (See fig. 8.)

Four-tailed Bandage.—This belongs to the special class of bandages, and is principally employed in fracture or other injury of the jaw or face.

It is made by taking a piece of bandage, about three feet in length and three inches in breadth, making in its centre a slit three inches long, distant one-third the breadth of the bandage from the one border and two-thirds from the other, and slitting it down at each end to the extent of about ten inches.

In applying it the chin is passed through the slit in the centre of the bandage, the narrower portion at the side of the slit being in front, two of the tails or slit ends are carried back and tied at the nape of the neck, and the other two carried upwards and tied on the top of the head.

Thoracic or Chest Bandages.—The bandages for the chest and upper part of the trunk are the following:—

The thoracic bandage is frequently employed to fix the walls of the chest in cases of fractured ribs, and also for the purpose of retaining dressings in position.

One end of a single-headed roller, either of flannel or calico, eight yards in length, is laid over the sternum, and carried from left to right round the chest, as close under the armpits as possible, and being fastened in front by a pin or stitch, is continued, in spiral, partially overlapping turns, down to the lower margin of the ribs, there fastened at one side by a stitch, and thence taken over the opposite shoulder to the lowermost turn of the bandage, behind where this end is made secure. A few stitches may be used to fasten this brace-like portion to each of the other turns of the bandage in front and behind.

Oblique bandage is employed to retain dressings in the axilla or on the shoulder. If for the left axilla, one end of a bandage being laid on the front of the chest, it is carried down under the axilla, across the back, over the opposite shoulder, and fastened by a pin or stitch in front. The bandaging is continued over this first turn as often as may be required, and finally fastened by a pin or stitch. If for the right axilla the bandage is carried from the chest over the left shoulder, across the back, and down under the arm-pit.

Bandages for the pelvis and lower part of the trunk consist of the spica, the T, the perinaeal, and the suspensory.

To these may be added the truss, although the latter can scarcely be considered as a bandage.

Spica or Groin Bandage.—This is a bandage in everyday use for retaining dressings or poultices on one or both groins.

To apply it. If the right side be affected the end of a single-headed roller is laid on the thigh of that side, and two turns made round it as a fastening. The bandage is then carried across the lower part of the belly to the

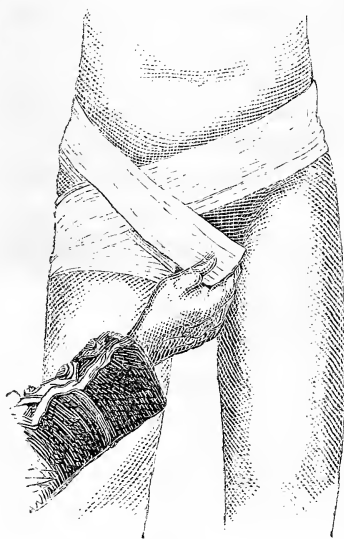


FIG. 9.

opposite haunch, across the back, down along the affected groin, between the legs, and round the thigh, and so repeated as often as may be necessary. (See fig. 9.)

If the left side be affected, after it is attached round the left thigh, the bandage is taken first up along the affected groin to the haunch of that side, then across the back, and returned across the belly and passed round the thigh, being exactly in the reverse direction to that taken in applying it to the right side.

If required for both groins, sometimes the same bandage is continued from one side to the other, but it is better to bandage each groin separately as above described.

The T Bandage.—This bandage is used for retaining dressings on the perinæum and about the anus.

A roller bandage being passed round the body just above

the hips for two or three turns, is fastened by a pin or stitch in front, and then carried downwards by the side of the scrotum, between the legs, and up to meet the circular turn behind.

It is next passed under the circular turn, and carried again between the legs to the front, and so repeated as often as necessary. It is lastly fixed to the circular turn by a pin or stitch.

Perineal Bandage.—This bandage belongs to the class special, and is employed in the treatment of fractures of the lower extremities by means of the long splint. It will be described under the head of Fractures.

Suspensory Bandage.—This is used for suspending the testicles, and also belongs to the special class of bandages.

It consists of a band to go round the hips, and a bag to contain the testicles. The band is buckled round the hips, and the testicles placed in the bag, with the penis through the opening in front.

A more useful apparatus for suspending the testicles, at the same time that it supports the penis, and retains dressings on it if required, may be very simply improvised in the following manner. A fine cotton sock is taken and an oval piece cut out of the instep, a piece of tape about three feet long is stitched at its middle to the head of the sock, and a similar piece sewed in like manner to the toe, and the apparatus is ready for use. To apply it, two of the tapes are brought round the hips and tied in a bow knot in such a manner as to suspend the sock with the heel opposite the lower part of the scrotum, the leg lying up one groin, the foot up the other. The testicles are then passed through the hole in the instep of the sock into the pouch formed by the heel, and the penis, with its dressing if required, up either the leg or the foot of the

sock. Next, the two remaining tails of tape are tied in a bow knot over the front of the belly.

Trusses.—The truss is an appliance used in the treatment of hernia, or, as it is commonly called, rupture. To understand its use it is necessary to know what rupture is.

By rupture is meant the protrusion of a portion of the contents of the abdomen, generally the intestine, through an opening in the abdominal wall under the skin, where it lies in a sac in the form of a soft tumour, varying in size according to the quantity of intestine protruded. In men it generally occurs in the inguinal region, either on the left or right side, at the lower part of the belly. The protruded intestine, if allowed to pursue its course, pushes its way under the skin, along the cord to the side of the testicle in the scrotum. The danger to be apprehended is that the intestine may be pressed on and constricted, or, as it is called, strangulated, and if so, death is very frequently the result.

In the treatment, the object in view should be the returning the protruded intestine into the abdomen, and the preventing its re-escape. For the latter purpose the truss is employed.

To return the intestine the patient should be made to lie on his back on a bed, with his thighs drawn up towards his belly. One hand narrows the neck of the tumour while the other manipulates and presses on its base until the contents are felt to slip away from the hand into the abdomen.

The intestine should always be returned before applying the truss; for if the truss press upon the protruded intestine, strangulation may be produced.

The intestine being thus returned, the truss, either right or left sided, according to the side on which the rupture

occurs, should be passed round the hips of the patient, the pad placed over the opening in the abdominal wall, and there secured by buttoning the circular strap and perinaeal tape.

It should be seen that the truss fits in such a manner as to prevent the gut escaping under it when the patient gets up.

Bandages for the upper extremity are required for various purposes, but it should be borne in mind that, as a rule, none should be applied when the bones of the forearm are broken, for reasons which will be explained when treating of fractures.

In bandaging either an upper or a lower extremity it is necessary to employ a combination of the simple spiral, reverse spiral, and crucial turns, according to the rules already laid down.

Bandage for a Finger or Thumb.—It is necessary to apply bandages to the fingers, not only for the purpose of retaining dressings upon them, but also to prevent them swelling when bandaging the forearm or arm.

The end of a bandage three quarters of an inch in breadth is attached to the wrist by a couple of turns, then carried over the palm or back of the hand to the root of the finger or thumb, and by two widely separated simple spirals round it to its point, next back again by regular simple spirals until the finger is completely covered, and lastly over the back

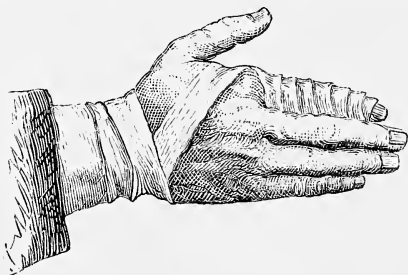


FIG. 10.

or palm of the hand to the wrist, where, after a turn or two, the ends are secured, either by a stitch or by tying them both together. (See fig. 10.)

Bandage for the Hand and Wrist.—A single-headed bandage is attached by a couple of turns to the wrist. It is then carried round the hand as near the fingers as possible, and back to the wrist by the figure of 8, repeating this until the hand is covered. A turn or two is next taken round the wrist, and the end of the bandage secured. (See fig. 11.)

Bandage for the Forearm.—A bandage about four yards in length is required for the forearm. Having bandaged the hand and wrist as above described, the bandage is con-

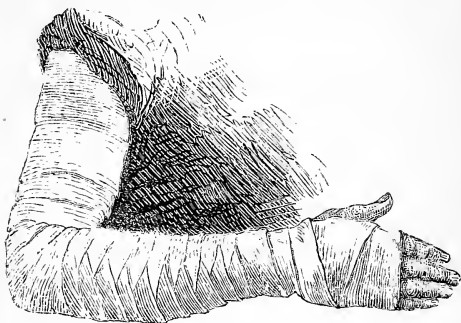


FIG. 11.

tinued by simple spirals to where the forearm commences to increase in size, from which point the reverse spiral turn is employed till close to the elbow, where the end of the band-

age is secured. (See fig. 11.)

Bandage for the Elbow and Arm.—Having commenced with a bandage six yards or even more in length, and bandaged as far as the elbow as above described, and the arm being placed in the position it is intended to occupy when the bandaging is completed, the elbow is covered by the crucial turn repeated as often as necessary. Immediately above the elbow one or two turns of simple spiral are taken, after which the reverse spiral is employed up

the thick part of the arm to the armpit, and the end of the bandage secured in the usual manner. When much pressure is exercised by this bandage, each finger should be bandaged separately to prevent swelling.

Handkerchief Sling.—This is used for supporting the forearm in fracture of the collar-bone, humerus, or some injury of the hand or forearm. A handkerchief folded as a triangle is generally employed, when necessary to support the elbow, the base of the triangle is placed under it; and the opposite angle comes under the hand, while the longer ends are carried at each side round the neck and there tied. When the hand and wrist alone require to be supported, as in fractures of the humerus, the base of the triangle should be placed at the fingers and the opposite angle towards the elbow.

Bandages for the lower extremity consist of bandage for the foot and ankle, bandage for the leg, bandage for the knee, bandage for the thigh, many-tailed bandage, and starch bandage.

Bandage for the Foot and Ankle.—The limb being held by an assistant, and the bandager standing opposite to and facing it, a single-headed roller bandage is attached by a couple of turns immediately above the ankle, and then carried across the front of the foot to the balls of the toes, where the first regular turn of simple spiral is made. It is next taken up the instep by two or three reverse spiral turns, the ankle is covered by turns of the figure of 8, and above it one or two simple spirals are made, and the end of the bandage secured.

Bandage for the Leg.—Having bandaged the foot and ankle as above described, after two or three simple spiral turns over the small part of the leg immediately above the ankle, reverse spirals are made up the thick part of the

leg nearly as far as the knee, care being taken not to make the turns of the reverse over the shin-bone. Just below the knee one or two simple spirals are made, and the end of the bandage made fast.

Bandage for the Knee.—In bandaging the knee, all the parts below it being first covered as described under Bandage for the Leg, the crucial is made to cover the knee by as many turns as may be requisite, one loop of the figure 8 being made round the leg close below the knee, and the other round the thigh immediately above it, the cross being on the front of the knee-cap. A couple of turns of simple spiral are made above the knee, and the terminal end of the bandage secured.

Bandage for the Thigh.—During the application of this bandage the leg should be well raised and supported by an assistant.

The limb having been first bandaged as far as and a little above the knee, and a couple of turns of simple spiral made at that part, the thigh is covered by reverse spiral turns quite to the top, and two turns of the spica are added, which check any tendency on the part of the bandage on the thigh to slip downwards. The end of the bandage is then made fast. (See fig. 12.)



FIG. 12.

Many-tailed Bandage.—Although in most frequent use for the lower extremity this bandage is also sometimes employed for the upper. It is used as a substitute for the spiral where there is a wound or sore which requires

dressing, or where it is desirable to avoid the movement attending the application of an ordinary roller bandage. It is most frequently employed in cases of compound fracture of the leg, and fractures of the thigh both simple and compound.

To make a many-tailed bandage: a strip of bandage of the length of the part of the limb it is required for is laid on a board or tray; other strips, each six inches longer than the circumference of the limb, are laid at right angles across it, each succeeding strip overlapping the preceding by two-thirds of its breadth. These are all stitched at their centres to the longitudinal strip.

To apply it: the limb being raised, the board or tray with the bandage spread out upon it is passed under it, care being taken that the strip last laid on shall be towards the part of the limb remote from the body. The limb is now lowered and laid upon the bandage, and the strip last laid on is carried round it and on its front, and so each strip in succession, the succeeding overlapping and fixing the preceding, and the last one secured by a few stitches.

Starch Bandage.—This, like the preceding bandage, is also sometimes employed for the upper extremity, although in most frequent use for the lower. It receives the name of a bandage, but, properly speaking, it is a bandage splint. It is used in the treatment of recent fractures, as well as a support when fractures are united, but not quite consolidated, and it may also be used as a means of steadying fractures in transport.

The materials necessary for its application are calico bandages, cotton wool, some strips of pasteboard, and starch. The starch is prepared in a basin, in the same manner as is done by laundresses, by pouring boiling water

upon it and beating the mixture thoroughly with a spoon. The pasteboard is cut into strips about two inches in breadth, and softened by pouring boiling water upon them in a basin or tray, and the bandage is unwound, saturated with the starch mixture, and re-rolled.

The limb, being washed, and held by an assistant in a natural position, is evenly enveloped by a thin layer of cotton wool, having first applied a strip of sticking plaster up the front to prevent the scissors injuring the skin when the bandage is being slit up. The bandage is then neatly applied in the spiral manner (if in the lower extremity, from the toes up to the perinæum, and in a neat spica round the groin), rubbing in the starch mixture as the proceeding advances. Strips of pasteboard are now placed round the limb at those parts where strength is required, and another spiral bandage applied over the whole, and starch rubbed into it also.

A splint is applied, and sand-bags are placed round the limb, to prevent displacement until the starch has dried, which will not be before at least two days. When dry it is cut up the front by strong scissors, or pliers, or by a penknife run along a director, but if the limb shows any symptoms of constriction, the slitting up should not be delayed.

CHAPTER III.

THE DRESSING OF SORES, WOUNDS, AND INJURIES.

APPARATUS GENERALLY EMPLOYED IN DRESSING.

Sticking plaster, called adhesive plaster, or resin plaster, is generally used as part of a dressing. It consists of a compound of resin, litharge, and soap, spread very thinly on one side of thin linen. It is used to bring the edges of wounds together, and to retain applications in position. It should be cut in strips, varying in breadth from a quarter of an inch to an inch and a half, and in the direction of the length of the web, and not across the breadth, as it will stretch and become useless if so cut. Before applying the strips they should be heated either by the fire, or by holding the linen side against a tin vessel containing hot water.

The edges of the wound should be held together with the finger and thumb of the left hand, while one end of the strip, held in the right hand, should be laid on the skin at a distance, and brought across the wound tightly.

When removing the plaster, one end should first be raised as far as the wound, and then the other end in a similar manner, and in this way tearing open the wound will be avoided.

Before the application of sticking plaster to any part of

the body it should be well dried, and all hairs be shaved off. Any of the plaster which may adhere to the skin will be readily removed by rubbing it over with a little olive oil, and then washing it with soap and warm water.

Soap Plaster is prepared much in the same way as sticking plaster, but with less resin. It therefore does not adhere so firmly, but it has the advantage of not irritating the skin. It is applied in the same manner as sticking plaster, and for the same purposes.

Isinglass Plaster is made by coating one side of a thin silk material with a transparent substance named isinglass, which becomes sticky when moistened. It is employed for bringing together the edges of wounds. It is rendered sticky by moistening the coated side with a damp sponge, care being taken not to rub the sponge more than once over it, otherwise the isinglass will be removed. It is easily removed by moistening it with water.

Bandages are used to retain dressings in position, and their mode of application has been described in the foregoing chapter.

Oiled Silk is made by saturating thin silk with an oil, which renders it impervious to water. It is used to prevent the escape of moisture from dressings, either by evaporation or by contact with the patient's clothing or bedclothes.

Gutta-percha Tissue is a thin semi-transparent substance used as a substitute for oiled silk, to prevent evaporation from dressings.

Oiled paper is also sometimes used as a substitute, but it tears easily, and is not very effective.

Lint is almost invariably used for dressings by British surgeons. It is a soft linen woven material, with a nap on one side. It should always be cut with scissors and not torn, as it will pull into shreds if the latter be attempted.

The side on which the nap is should be placed next the skin, and on this side all ointments should be spread ; but on this point there is difference of opinion.

Charpie is almost universally used for dressing purposes by Continental surgeons. It is composed of ravellings, or shreds, torn or scraped from linen, and is of two kinds, viz., torn or rough charpie, and scraped charpie.

Torn or rough charpie is prepared by taking pieces of old soft linen or lint, varying in size from two to four or six inches square, according to the kind required, whether short, medium, or long. Tear the linen in pieces in preference to cutting it. Take each piece firmly in the left hand, unravel it thread by thread with the forefinger and thumb of the right hand, and mix the whole up softly, removing all knots, hard threads, and lumps.

Scraped charpie resembles soft flocculent down in appearance, and is prepared by scraping old soft linen. Take a piece of linen, stretch it in the most convenient way, so as to keep it on the strain, and scrape it with a knife, collecting the down thus removed ; mix it softly, removing all lumps.

The linen from which charpie is made should be soft and scrupulously clean. If it is at all soiled, it should be previously thoroughly washed with boiling water and soap.

Charpie when packed should be kept in boxes, free from damp and moisture.

Oakum was used in the American war as a substitute for lint and charpie, and was found to possess so many advantages that it is likely in future to be extensively employed in military surgery.

The material is old rope, shredded in prisons and work-houses, and carded by machinery. It is of a bright brown colour, with a tarry odour.

A little of the oakum thus prepared is teased and drawn into a suitable shape for covering the wound, and applied in the same manner as charpie. It absorbs the discharge from wounds, and being impregnated with tar, acts as a disinfectant to destroy any bad odour arising from them.

Cotton wool, or Medicated Cotton, is the raw material from the seeds of the cotton plant, purified, bleached, carded, and rolled into sheets or flakes. It is a white, soft, downy material, employed for stuffing the pads for splints, sometimes in dressings, also to envelop any part which exhibits an uneven surface in order to equalize the pressure of bandages upon such parts. In the application of the starch bandage it is used to prevent, by its yielding properties, the constriction of the limb by the contraction of the bandage in drying.

Tow is the fibre of flax or hemp teased and loosely carded into sheets, and done up in rolls. It is employed to absorb discharge from wounds, as a substitute for sponges in washing wounds, and as a material upon which poultices are spread before applying them; for which latter purpose, however, old pieces of rag may be used if at hand. It is also used for stuffing pads for splints.

Sponges are employed in dressing wounds as a means of conveying water to the part, and to remove by patting or dabbing any matter which may adhere to the surface of the wound. Their use, however, for dressing purposes is in many cases objectionable. They are expensive, and so have to be repeatedly used, while they are difficult to keep clean, and may be the means of conveying poisonous matter from one wound or sore to another. Tow and oakum, from their cheapness, answer the purpose better, as they can be destroyed or thrown away after use.

Sponges are also used in operations in order to absorb the blood, which would otherwise hide the parts from the view of the operator. When used for this purpose they should be soaked in water, as cold as can be obtained, and then squeezed thoroughly dry before applying them to the wound.

Whenever sponges are employed for any purpose great care should be taken to cleanse them thoroughly, by washing in several relays of water, to which some disinfecting fluid has been added.

Water is employed in dressing to cleanse the wound or sore from discharge and other substances which may be adhering to it. It should in all cases be scrupulously clean, and, where possible, the supply abundant.

The temperature at which water is applied to wounds varies according to the nature and state of the injury, and ranges from ice cold to blood heat. This, however, and the manner of applying it, will be described hereafter when speaking of the manner of preparing wounds to receive dressings.

Water is also used as a dressing of itself, in water dressing, evaporating dressing, and irrigation, and its use is described under those heads. It is also employed in fomentations.

Basins for dressing purposes should be of a size large enough to contain sufficient water to thoroughly wash the wound. One is placed below the part to be washed in such a position as to catch the water as it flows off the wound, while another contains the fresh water which is being allowed to trickle over the wound.

By the use of two basins the water applied to the wound is kept constantly fresh and free from contamination by discharge, &c., from the wound, and the risk of conveying

contagious matter from the wound to the hands of the attendant is greatly diminished.

Basins, after being used, should be emptied and thoroughly washed (with hot water, if possible), and with the addition of some disinfecting fluid.

Disinfectants.—In wounds which give off an offensive odour some one or other of the disinfectants now in common use should be added to the water with which they are washed, and the washing of the wound continued until the offensive smell is destroyed. For this purpose either carbolic (phenic) acid, in the proportion of one part to two hundred parts of water, or Condyl's fluid in the proportion of one part to one hundred parts of water, may be employed.

Carbolic acid is also used in Professor Lister's antiseptic mode of dressing wounds, and is described elsewhere.

Poultices of a deodorizing nature, such as charcoal poultice, are also employed, and are described hereafter.

A *Waterproof sheet* is employed in dressing wounds in order to protect the bedclothes from damp or from being soiled by dressings or discharge. It is merely a piece of vulcanized india-rubber cloth, cut to a convenient size, and when used should be so arranged that the water spilt on it is conveyed by a gutter or channel into a vessel placed by the side of the bed to receive it. To insure this the centre part of the waterproof sheet, which is under the limb, should be raised by placing pillows or other articles beneath it, taking care at the same time that it is so placed that none of the water flows backwards under the patient's body.

In the absence of a waterproof sheet, an ordinary cotton or linen sheet, folded in several thicknesses, should be placed

in a similar manner under the part to be washed, in order to absorb the moisture.

Dressing-tray.—A tray, either of tin or wood, is employed for the purpose of containing the materials and appliances necessary in dressing wounds. Thus each article will be by the bedside of the patient when it is needed.

Scissors.—A pair of strong, sharp scissors is necessary to cut up clothing, and to cut lint, sticking plaster, and other dressing materials.

Forceps.—A pair of ordinary dressing forceps is necessary for the purpose of removing any particles of dressing, foreign body, or other matter which may adhere to the wound, and also for introducing small portions of lint or other dressing into a wound, and may be considered in the light of a finger and thumb with which to take hold of small articles. The hands should not be brought in contact with the discharge from wounds and sores more than is absolutely necessary.

Probe.—A small silver probe, which is merely a silver wire with a small bulb at one end, is useful in dressing wounds to convey small pieces of dressing into small or deep openings which are inaccessible to the fingers.

Syringe.—A glass syringe, of from one to two ounces capacity, is employed to inject fluid into sinuses or deep cavities, and also in some instances—as in Lister's anti-septic dressing—to convey a stream of fluid over a part.

PREPARATION OF THE PART BEFORE THE APPLICATION OF A DRESSING.

Washing.—To wash a recently inflicted wound cold water should be employed, as it has a tendency to stop the bleeding, while warm water favours it; but in the case of

old wounds or ulcers, warm water at a temperature of about 98° is better suited, being more grateful to the feelings of the patient, and being more effective in softening hardened dressings, and cleansing a foul surface. Some disinfecting fluid should be added to the water when the discharge is offensive.

In washing a wound or sore the bed should be protected by a waterproof sheet, so arranged that any water falling on it will run down a gutter into a vessel placed by the side of the bed to receive it. The limb should be raised by an assistant, and a basin, tray, or other vessel placed under it to receive the water. The basin containing the water for washing being placed so that the dresser can get at it conveniently, the tow or sponge charged with water is held over the wound or sore, and the water made to trickle down from a height on to it. It should never be attempted to rub the surface of a sore or wound, but the tow or sponge should be patted on it, and any adhering matter thus removed.

Old dressings often become very adherent and stiff by blood and discharge, and no small amount of patience is necessary to soften and saturate them thoroughly, but no attempt should ever be made to drag them away by force. The old dressings are to be thrown into the bucket, and removed from the ward as soon after as possible.

Hairs in the vicinity of a wound always give rise to trouble in the removal of dressings, therefore as a precautionary measure the part about to be dressed should, in the first instance, be cleanly shaved, or the hair closely clipped.

KINDS OF DRESSINGS.

Dry dressing is generally used as the first application to wounds. It consists of plaster and dry lint. The edges of

the wound should be brought together as nearly as possible by strips of plaster, and over these should be placed a couple of folds of dry lint bound down by a few more strips of plaster. A bandage may also be applied over the whole if in a position to admit of it.

In the removal of dry dressing care should be taken to saturate the lint thoroughly with lukewarm water while it is gently pulled away, so as to avoid tearing open the wound, and breaking down the union which may have taken place. Dry dressing may be allowed to remain on for two or three days before it is removed.

Antiseptic Dressing.—This mode of dressing wounds has lately been introduced by Professor Lister. The following are his directions for its application in gunshot wounds:—

“Wash the wound thoroughly, and also the surrounding skin, with a saturated solution of crystallized carbolic (phenic) acid in water, one part of the acid to twenty of water, introducing the fluid by means of a syringe, and manipulating the part freely, so as to cause the lotion to penetrate into all the interstices of the wound, and at the same time squeeze out such clots of blood as it may contain. The fluid should be introduced repeatedly to insure its thorough penetration. Tie any bleeding vessels with properly prepared antiseptic catgut, cutting off the ends of the thread near the knot. If the surgeon does not possess this article, the arteries should, if possible, be secured by torsion; but for the sake of cases in which a ligature would be absolutely indispensable, some silk or linen thread should be kept steeping in a strong oily solution of carbolic acid, or if very fine silk be used, it may be rendered antiseptic by steeping for a few minutes in the watery solution. When silk or linen is employed, the ends of the ligature should be left projecting at the wound. While the antiseptic

lotion is in the wound, extract, if possible, any foreign material that may have been introduced, such as a bullet or portion of the patient's clothes; and if any spicula of bone exist, entirely detached from the soft parts, remove such as can be readily reached, disregarding those which are of very small size or inconvenient of access. Then place upon the wound two or three layers of oiled silk, smeared on both sides with a solution of carbolic acid, in five parts of any of the fixed oils—olive, almond, linseed, &c.,—the oiled silk being made large enough to cover the raw surface completely, and slightly overlap the surrounding skin. Next apply, without loss of time, lint, charpie, or cloth (linen or cotton), well steeped in the oily solution of the acid, the cloth or lint being folded sufficiently to produce a layer at least a quarter of an inch in thickness, and extending a considerable distance, say three inches, beyond the oiled silk in all directions, the outer layer being somewhat larger than the rest, so that the margin of the mass of cloth may be thin. Cover the oily cloth with a piece of thin gutta-percha tissue sufficiently large to overlap it on all sides by an inch or more, and retain it securely in position by a roller steeped in the antiseptic oil. Round this again wrap a still larger piece of folded cloth, say a folded towel, also steeped in the oily solution of carbolic acid, and cover it with a piece of oiled silk or gutta-percha."

"The changing of the outer cloth will require care in order to avoid raising the edges of the gutta-percha along with it, and so admitting septic air towards the wound. It may be done with perfect security by having the cloth consist of two parts, one covering each half of the gutta-percha, and, as one half is raised, throwing a stream of watery solution (1 to 40) with a syringe upon the margin of the gutta-percha, a fresh oiled cloth being at once applied before the

other portion of the former cloth is removed. If sufficient time cannot be spared for changing the outer cloth in this careful manner, it will be better for the surgeon to content himself with pouring fresh oily solution upon the exterior of the cloth without disturbing it, taking care that the oil enter well between its margins. I would advise that this should be done in preference where a large number of wounded have to be treated by one surgeon."

"The strong oily solution (1 to 5) would irritate the skin if used continuously, and after the first dressing a solution of half the strength should be employed, and after a few days it may be reduced to 1 to 20 if excoriation should occur.

"The times of changing the outer cloth, or treating it with fresh oil, should be in accordance with the amount of discharge. During the first twenty-four hours the effusion of blood and serum is necessarily profuse, and it will be well that fresh oil be applied to the outer cloth within twelve hours of the first dressing, or even in six hours if there should be unusual oozing. On the second day also, in the case of a large wound, two dressings in the twenty-four hours will be desirable. After this, if all goes well, the discharge will diminish quickly, and a daily renewal of the antiseptic supply will be sufficient; and when five or six days have passed, to apply the oil once in two days will be all that will be required. This, however, should be continued after discharge has ceased entirely, till sufficient time has passed to insure that the wound has healed by scabbing, or at least has been converted into a superficial sore."

Water dressing is the most frequently used of all dressings in ulcers and wounds, and it is of the greatest importance that a thorough knowledge of the mode of

applying it should be acquired, inasmuch as most lotions are applied after the same manner.

The application consists of lint, saturated with water and covered over with oiled silk, gutta-percha tissue, oiled paper, or some other waterproof material, to prevent evaporation or the escape of moisture into the surrounding bedclothes.

The lint should be double (the two plain sides towards one another, the nap side to the wound), and of a size according to the surface to be covered. The waterproof material should be cut a little larger than the lint. Care should be taken that none of the lint projects from under the edge of the covering, for if such be the case the water will escape into the bandage and clothes, leaving the lint dry and sticking to the wound. Over the whole may be placed a common roller bandage.

Water dressing should be renewed twice in every twenty-four hours, or more often if there be much discharge.

Evaporating dressing consists of a single fold of lint, saturated with water or some lotion, placed over the injured part and freely exposed to the atmosphere to favour evaporation. The object in view is the production of cold by evaporation, and consequently a low temperature of the injured part. The lint should be of considerable size and kept constantly wet, and the limb to which it is applied should be placed on a waterproof sheet, under a cradle, and completely uncovered by bedclothes.

Irrigation is a stream of water conducted over an injured part to prevent inflammation. It is had recourse to frequently for stumps after amputation. The simplest mode of effecting it is by placing a basin or other vessel containing water near the patient's bed, on a little higher level than the injured limb. From this a skein of worsted or

cotton thread, one end in the water and the other on a piece of wet lint laid over the part to be irrigated, conducts the water in a constant, trickling stream. Care should be taken to saturate the cotton first in the water, otherwise the current will not be established, also to see that it contains no grease. A waterproof sheet should cover the bed, so arranged that the excess of water may be conducted along a channel into a vessel placed by the side of the bed.

Ointment Dressing.—Ointments are of various kinds and are frequently used in the wards of an hospital as dressings for ulcers and wounds. When used, ointment is spread with a spatula in a thin layer on one side of lint.

The lint thus prepared is applied to the part and maintained in position by a few cross strips of plaster, and, if necessary, a roller bandage. Once a day will be sufficient to dress an ulcer, except when the discharge is profuse, when it may be necessary to renew the application twice or even three times during that period. Simple ointment is usually kept in wards for general use, and is employed to prevent applications sticking to the surface of a sore.

Linseed-meal poultice is made from linseed-meal, with boiling water, and spread upon tow or rag. Linseed meal, boiling water, a little olive oil, some tow, a basin and spoon, are necessary for its preparation.

The tow, being neatly teased, is placed on a table or board and spread out to the required size. The required quantity of boiling water is then put into the basin, already scalded out, and the meal added, a little at a time, and beat up with a spoon until the whole is well mixed and of a proper consistency. The pulp thus formed is next turned out of the basin upon the tow, and neatly and smoothly spread with a spoon in a layer about three-quarters of an inch thick, leaving a margin of tow un-

covered about one inch in breadth. A little olive oil is now to be spread over the surface to prevent it sticking to the skin, and the margin of tow being rolled up, the application is ready.

When applying a poultice one edge should first be laid on the skin, distant half its breadth from the centre of the sore or swelling, and the rest of it gently lowered until it covers the part. A light bandage should then be applied over it to retain it in position and prevent it falling off.

A poultice should be considerably larger than the sore or swelling to which it is applied, and should be renewed at least twice a day. Care should be taken not to apply a poultice too hot to a tender surface.

Bread poultice is sometimes used. It is made from the inside part of a loaf. The bread is put into a small basin, boiling water poured upon it, and being allowed to stand for a little time, the water is strained off and the whole beaten up into a pulp and treated in the same way as the linseed-meal poultice just described.

Charcoal poultice is frequently used for foul ulcers and sloughing sores. The materials necessary for its preparation are charcoal in powder, $\frac{1}{2}$ oz.; crumb of bread, 2 ozs.; linseed meal, $1\frac{1}{2}$ ozs.; boiling water, 10 ozs.

The bread is first soaked in the boiling water, next the linseed meal added, and the whole beat up into a soft pulp; lastly, half the charcoal is well mixed with the pulp, over which, when spread, the remainder of the charcoal is to be sprinkled.

CHAPTER IV.

THE FIRST ASSISTANCE TO BE RENDERED TO WOUNDED ON THE FIELD OF ACTION.

It frequently happens in great battles that large numbers of men are wounded at nearly the same time, so that it is impossible for immediate assistance to be given to all by the medical officers of the forces engaged. Therefore it becomes necessary that bearers and others who have to do with the care and removal of the wounded should possess a knowledge sufficient to enable them to render such *immediate assistance* as may be required to give safety and comfort to the sufferers until medical aid can be obtained.

Thus, when a man falls wounded in the field, the order of procedure should be to seek for the position of the wound; to remove clothing so as to expose it; to see if there be hæmorrhage, and if so to take immediate steps to arrest it; to loosen all belts, accoutrements, &c., likely to cause constriction; to administer such stimulants or drinks as may be available; to apply a temporary dressing, or, in cases of fractured limbs, such appliances as may be necessary to prevent pain and further mischief being done by the sharp ends of the broken bone in transport to the first line of surgical assistance; and by the best mode of lifting and laying the wounded, to place him either in a place of safety or on a conveyance.

To seek for the Wound.—If the wounded man be unable,

from weakness or insensibility, to explain where he is hurt, the attendant will be guided to the position of the wound by torn clothing, the appearance of bleeding, or, by the patient clutching the injured part.

To Expose the Wound.—Having ascertained the position of the wound, the attendant should completely expose it before attempting to dress it. At the same time he should be very careful not to expose more of the patient's body

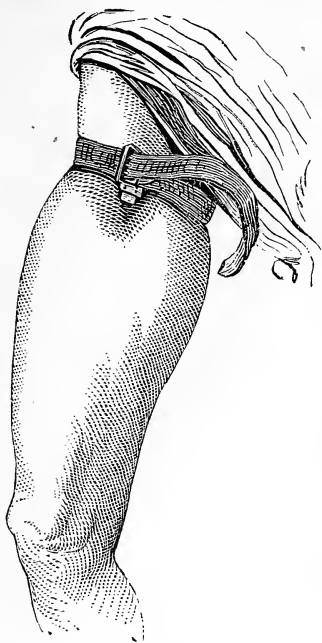


FIG. 14.—Field tourniquet on thigh.

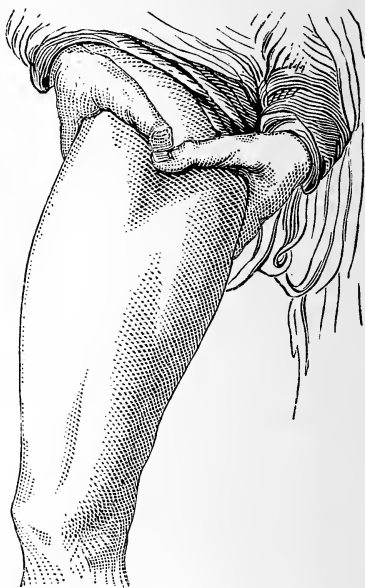


FIG. 15.—Pressure by hands on femoral artery.

than is absolutely necessary, in order that the vital force may not be diminished from a lowering of the temperature of the body.

In the lower extremity the trousers should be ripped up the seam to a short distance above the wound; and where much bleeding is taking place, as high up as will enable the attendant to get at the femoral artery in the groin or upper part of the thigh, and apply pressure upon it if necessary. If the boot and sock require to be removed, they should be cut open, and no attempt made to pull them off, lest in doing so the injury be aggravated.

In the upper extremity the sleeves of the coat and shirt should be ripped up the seams to a little above the wound; and where much bleeding is taking place as high as the arm-pit, so as to enable the attendant to get at the brachial artery, and apply pressure upon it if required.

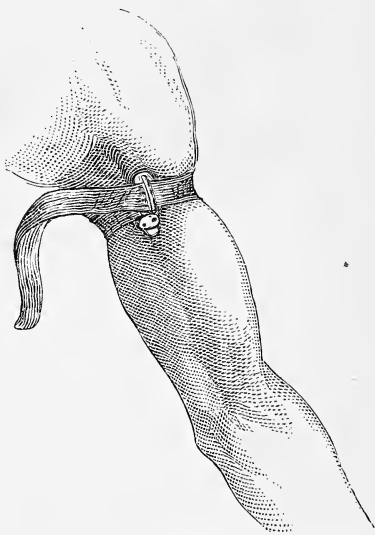


FIG. 16.—Field tourniquet on arm.

In the body the wound may be laid bare by unbuttoning the coat, shirt, trousers, &c. The clothes, however, should not be removed from the body unless absolutely necessary, as wounded are very susceptible of the effects of cold.

To arrest Bleeding.—When the wound has been laid bare, it will be seen whether bleeding is taking place or not. If so, no time should be lost in having recourse to some of the measures for arresting the flow of blood, as every moment is of the greatest importance as regards the

life of the wounded. It is computed that no less than one-fifth of the deaths which occur on a battle-field are attributable to hæmorrhage. It will therefore be seen how important it is to be thoroughly acquainted with the means at our disposal for arresting this bleeding, which is so destructive of life, not only in such a large number of cases, but in such a short space of time.

The blood—the fluid on which life depends—is always in motion, circulating through the body in the arteries and veins. Forced along these arteries by the heart, which acts as a pump, the blood travels with great rapidity, and finds its way into the most remote parts of the body. It is then taken up by the veins and carried back to the heart, from thence it passes to the lungs to be purified, and back again to the heart, to be again forced along the arteries to the remote parts of the body.

When there is a lesion or wound of any of the vessels in which the blood circulates, bleeding takes place, in large or small quantity, in proportion to the size of the vessel injured, and varies in character according as to whether it is a vein or an artery which is wounded.

When a vein is wounded, the blood that is poured out is of a dark colour, and flows in a slow, uniform, trickling stream, and from that side of the wound which is most remote from the heart. If there be any pressure between the wound and the heart it prevents the blood passing along the veins to the heart, and so increases the flow of blood from the wound.

When an artery is wounded, the blood that escapes is of a bright red colour. It spouts out in a quick, jerking stream or jet, and comes from that side of the wound which is nearest the heart.

The force of the jet of blood will depend upon the size

of the artery. When a large artery is wounded, such as the femoral or carotid, a few moments are sufficient for life to be destroyed.

Bleeding from an artery is called *arterial* hæmorrhage, while that from a vein is called *venous* hæmorrhage. Arterial hæmorrhage is more dangerous than venous, and more difficult to arrest. The characters of each should be noted, so as to be able to distinguish the one from the other, with a view to the means to be adopted in the treatment.

If the bleeding be *venous*, all constriction or pressure between the wound and the heart should be removed; the patient should be placed in an inclined position, lying down if possible, and, if the wound be in any of the extremities, the limb should be raised. If the bleeding still continue, the wound may be stuffed with pieces of dry lint, charpie, or old linen, and a compress placed over it. It should never be attempted to heap a quantity of cloths over a bleeding wound, as such cannot exercise any pressure, and may do a great deal of harm by concealing the bleeding going on beneath them.

If the bleeding be *arterial*, the means for arresting it may be divided into those employed at the seat of injury, and those at a distance from it on the main artery leading to it. When it is ascertained from the character of the bleeding that it is arterial, no time should be lost in placing the face of the thumb on the bleeding point, within the wound, and making firm pressure on it, aided by the fingers and thumb of the other hand, if necessary. This pressure should be maintained, and the escape of blood prevented, until some of the other, more permanent, means can be employed or medical assistance be procured.

This means of pressure, which is called *digital*, may be replaced by a graduated compress, or by a ligature.

To apply a graduated compress, a piece of lint or other material is lightly folded to about the size of the point of the finger. This is slipped under the thumb on the bleeding point, and pressed there until another piece, a little larger, is placed on the top of it; and so on, until the pile so formed rises above the surface or edges of the wound, cone-shaped, with its point or apex on the wound in the vessel, its base rising above the surface of the part where the wound is situated. A small pad should now be placed on the base of the cone, and a bandage tightly applied; in the extremities commencing from the lower part of the limb.

To tie a ligature. The edges of the wound should be lifted up, and if a vessel be seen spouting, a tenaculum should be thrust through it; and it being pulled out, a strong thread should be passed round it, below the tenaculum, and tied in a double knot. If a second or more vessels be seen spouting, they should be hooked up and tied in a similar way.

Pressure at a distance from the wound, on the main artery, may be made either by the hand or by means of a tourniquet, and the position of exercising such pressure will vary according to the nature and situation of the wound. The object in view is to cut off the supply of blood from the wounded part.

If the wound be on one of the lower extremities, the points selected are the upper and inner part of the thigh, and the groin where the femoral artery emerges from the abdomen. Here the artery has little covering, and behind it are bones against which it can be compressed.

If the wound be on one of the upper extremities, the point selected is the upper and inner part of the arm, over the brachial artery, just below the armpit, where the vessel has little more covering than the skin, and has beneath it

the hard bone, against which it can be compressed. If the wound be in the axilla, the point selected for pressure is on the subclavian artery as it passes over the first rib, behind the middle of the collar-bone. If the wound be on the face, head, or upper part of the neck, the position selected is a point at the side of the windpipe, over the common carotid artery, corresponding to the side of the body on which the wound is situated. Here the vessel has little covering, and behind it is the spinal column, which affords a firm substance against which it can be compressed.

To press with the hands. The limb should be grasped with both hands, one thumb placed over the other on the course of the artery, and firm pressure made until the flow of blood through the artery is stopped, which will be known by observing the wound. (See fig. 15, page 52.)

The course of the artery will be known by its pulsation, and thus the point for pressure will be selected. Pressure will be in vain if it is not applied directly over the vessel.

To press by a tourniquet. The ordinary tourniquets supplied are of two kinds, the field tourniquet and the screw tourniquet.

The field tourniquet consists of a strap, a pad, and a roller buckle. The pad is placed over the artery and the strap brought round the limb through the buckle. Then steadying the pad in its place with one hand, the strap is tightened with the other, and buckled. (See figs. 14 and 16.)

The screw tourniquet consists of two plates, a thumb-screw, a pad, and a strap or girth. The screw should be unscrewed until the plates are brought together, the pad beneath the plates is then placed over the artery, the strap carried round the limb, and buckled, without being so tight as to constrict the limb and stop the return of the blood

by the veins. The screw is then quickly twisted, which has the effect of separating the plates, and so making the requisite pressure, by tightening the strap round the limb.

It may often happen that no tourniquet is available, then it will become necessary to improvise one.

A substitute for the strap may be made of a piece of bandage or a handkerchief; for the pad or compress, of a roller bandage or a smooth stone; and for the buckle or screw, of a piece of stick, a ramrod, or bayonet. The substitute for a pad being placed over the artery, the bandage or handkerchief should be passed once or twice round the limb, and tied securely over the pad. It must not, however, be tied tightly on the limb, but sufficient space must be left to admit the stick, or whatever is used for twisting. The stick is then passed between the bandage and the skin (if available, a piece of thin board, bark, or stiff leather being first placed between the stick and the skin to prevent the latter being pinched). The stick is then twisted until by tightening the handkerchief or bandage the pad is pressed upon the artery with sufficient force to arrest the flow of blood.

To remove Constrictions.—The braces, the collar of the shirt or tunic, the waistband of the trowsers, tightly laced boots, and straps or accoutrements, are the things most likely to cause constriction. These should be at once loosened, lest by their pressure they increase the flow of blood from the wound by impeding the venous circulation, or obstruct the breathing.

To administer Drinks and Stimulants.—Wounded often become faint, and when there is much loss of blood, experience unquenchable thirst.

In such cases, they should be kept as much as possible in the lying-down position, and water, or other fluids,

should be given to drink freely. Wine or spirits should be added where there is much weakness.

To apply a Temporary Dressing.—Before attempting to remove a wounded man, it is essential that some dressing should be applied to the wound, as a temporary measure, until he can be conveyed to the first line of surgical assistance.

The blood should be wiped from about the wound, and if water be available, the part may be washed with cold water before the dressing is applied. In wounds of the extremities, a piece of dry lint, folded once or twice, should be placed over the wound, and secured in its position by a bandage, a few strips of sticking plaster, or other means. Where a fracture exists, the splints subsequently applied will serve to retain the dressing in its place. In wounds of the scalp, the hair should be clipped off close around the seat of injury, a piece of dry lint folded and laid lightly over the wound, and retained in its place by a few strips of sticking plaster, or a turn or two of a bandage, if practicable, lightly applied.

Care should be taken in applying dressing to wounds on the scalp not to press upon the injured part; as, if the skull be fractured, the broken bone may by such means be forced down so as to press upon the brain.

If much bleeding occur from a wound of the scalp, pressure should be made either upon the common carotid artery in the neck, as already described, or upon the temporal or occipital artery of that side at some distance from the wound.

In wounds of the chest or abdomen a few folds of dry lint should be placed over the wound, and held firmly in situation by a roller bandage, or by a handkerchief tied round the part.

When, as will often happen, a limb is torn away by round shot, the artery will, as a rule, be seen hanging out, and will be known by its throbbing or pulsating. It should be secured by a ligature, and a tourniquet should be tightly applied close to the end of the stump, which will have the effect of preventing the trickling of blood, and of controlling muscular spasms. A wet cloth should also be wrapped round the stump.

To secure Fractures.—Where bones of the extremities are broken, splints of some kind should be employed to fix them, and prevent movement. If this be not done great suffering is caused to the patient during transport, and the injury may be so aggravated as to lessen considerably the chances of recovery.

Two sets of splints, furnished with pads and straps, might be made to answer as a temporary measure for this purpose, and should be carried attached to each stretcher.*

The set for the lower extremity should be two in number, one two feet and the other one foot eight inches in length, and each four inches in breadth. The set for the upper extremity should also be two in number, each three and a half inches in breadth, the one nine inches, and the other twelve inches in length. The set for the lower extremity would require four straps, that for the upper two straps, with buckles.

In fracture of the bone of the arm, the bleeding having been stopped by some of the means described above, and the wounds dressed as has been directed, a bandage should be applied to the forearm from the fingers to the elbow. This done, the short splint should be placed on the inside of the arm, the long one on the outer, and the straps passed

* "Field transport splints," recommended by the author for use in the British army.

round them, and buckled sufficiently tightly to keep the broken bone steady. The arm should then be bent, the forearm carried across the chest, and the hand supported in a handkerchief sling. (See fig. 17.)



FIG. 17.

In fracture of the bones of the forearm, the bleeding having been stopped and the wound dressed, the same set of splints are used. The arm being bent, the short one should be placed on the front, the long one on the back of the forearm, and the straps then carried round and buckled sufficiently tightly to keep the broken bones steady. The hand and forearm should then be carried across the chest and supported in a handkerchief sling. (See fig. 18.)

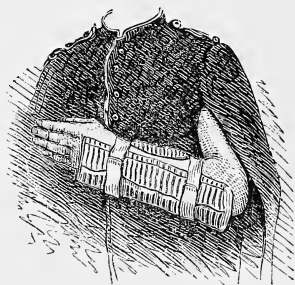


FIG. 18.

In fracture of the thigh, the bleeding having been stopped and the wound dressed, the broken limb should be bandaged from the toes as high as the knee, and then drawn down until it is the same length as the sound one. The splints should next be applied, one on the outside, its upper end as high as the haunch bone; the other on the inside, extending from the fork to some little distance below the knee. The straps are then to be applied, one immediately below the fork, one just below the knee, the third midway between the two, and the fourth round

the hips. Each of these straps should be buckled sufficiently tightly to keep the broken bone steady. (See fig. 19.)

After the splints are applied, the broken limb should be tied, strapped, or bandaged to the sound one, in at least two or three places before any attempt is made to remove the patient.



FIG. 19.

In fracture of the leg the same splints should be used. The bleeding having been stopped and the wound dressed, one splint should be placed on the inside, and the other on the outside of the leg (taking care when doing so to see that the ball of the great toe is in a line with the knee-cap, and not turned to either side). One strap should then be passed round below the knee, one round the ankle and foot in the shape of the figure 8, the third midway between these two, the fourth above the knee, and the whole buckled sufficiently tightly to keep the broken bones steady. (See fig. 20.)

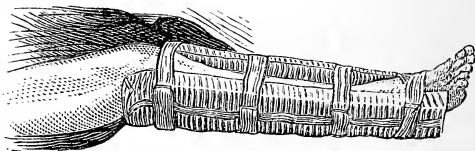


FIG. 20.

The limb, after the splints have been applied, may be securely fastened to the sound limb, either by straps, handkerchief, or bandage, before attempting to remove the patient.

Where splints such as recommended above are not available, a musket, sword, piece of wood, &c., may be employed, or the injured limb may be bandaged to the sound one.

To lift and place in a Place of Safety or on a Conveyance.
—The best methods of lifting and placing wounded on stretchers, ambulance waggons, &c., having to be hereafter described, reference should be made to the chapters on those subjects.

Where bones are fractured, great care is necessary in lifting the patient, so as to prevent bending at the seat of injury. One hand should be placed under the limb, immediately above the fracture, and the other hand immediately below it, forming a bed of the palms of the hands for the limb to rest upon, and thus preventing the limb from being bent at the seat of fracture when lifting it.

One attendant should give his undivided attention to the fractured limb, while the body of the patient is lifted by other attendants.

Special care should always be taken to notice the part injured and the nature of the injury, as these determine in a great measure the position in which the patient should be placed during transport. In all cases the head should be kept low, and on no account pressed forward on the chest.

In wounds of the head care should be taken that he is not placed so that the injured part presses against the conveyance.

In wounds of the lower extremity the patient should be laid upon his back, inclining towards the injured side; such position being less liable to cause motion in the broken bone during transport in cases of fracture.

In wounds of the upper extremity, if the patient require to be placed in a lying down position, he should be laid on

his back, or on the uninjured side; as in cases of fracture there is less liability in such a position of the broken bones being injured during transport.

In wounds of the chest there is often a difficulty of breathing. In such cases the patient should be placed with the chest well raised, his body at the same time being inclined towards the injured side.

In wounds of the abdomen, the patient should be laid upon the injured side, with his legs drawn up; or, if the wound be in the front of the abdomen, he should be placed upon his back, and his legs drawn up, so as to bring the thighs as close to the belly as possible; a pack or other article being placed under his hams to keep his knees bent.

CHAPTER V.

STRETCHERS AND THE PROPER CARRIAGE OF SICK AND WOUNDED BY THIS MODE OF CONVEYANCE.

DESCRIPTION OF STRETCHERS.

The regulation stretcher of the British Army consists of two ash poles, two iron traverses, a canvas bottom, a pillow, four cord lashes, and two shoulder slings, and is thus constructed.

The two poles are each eight feet long and about five inches in circumference, except for a short space near their extremities, where they are slightly diminished to adapt them for being handled. Two plain iron rods, each twenty-two inches in length, one inch in circumference, and terminating in a ring at one end and a hook at the other, are attached by their rings to two staples fixed at a distance of seven inches from the ends of the two poles, but on opposite sides and ends of the stretcher.

At a corresponding distance from the end of each alternate pole is an opening in the pole itself of a size proper for receiving the hooked ends of the iron rod. These iron rods, when hooked across, form the traverses, and complete the framework of the stretcher.

The sacking is made of a piece of stout canvas, folded over down each side so as to form two plaits sufficiently large

for the poles to be run through them. At one end is a small horsehair pillow, also covered with canvas, and secured to the sacking by leather thongs passed from it through openings in the sacking and tied on its under surface.



FIG. 21.

Two stout leather straps or slings, looped at their ends, are provided for each stretcher, but are not connected with it by any fixture. They are intended to be passed round the necks of the two bearers, to act as braces and assist in keeping up the weight of the stretcher when in use. One end of each strap is provided with eyelet holes and a buckle, so that it may be lengthened or shortened according to the respective heights of the bearers. The other end has a loop only for receiving the end of one of the poles of the stretcher.

When the stretcher is not required for use, each traverse should be unhooked and turned in along the poles, the canvas rolled round the poles, the slings stretched upon the rolled canvas, and the cord lashes bound tightly round the whole. (See fig. 21.)

When required for use the cords should be undone, the canvas unfolded, the traverses hooked into their proper places, and secured by a pin to prevent their slipping out, and the canvas bound tightly to them by the cord lashes. (See fig. 22.)

In addition to the regulation stretcher, another form of stretcher is sometimes used, viz., the ambulance waggon stretcher; but as this forms part of the equipment of the ambulance waggon, its construction will be more fitly described when treating of that subject.

THE PROPER CARRIAGE OF STRETCHERS.

The main purposes to be kept in view in carrying a stretcher are, firstly, that as little as possible of the impulse connected with the progression of the bearers shall be communicated to the stretcher which they are bearing; and, secondly, that the conveyance may be kept level, and as near the ground as is consistent with free carriage and the absence of risk of contact. If the conveyance be badly carried, it may be shaken in such a way by the movements of the bearers as they step along, that the patient may be rolled upon it from one side to the other alternately, or it may have such a motion communicated to it that the patient may be jerked *upwards* with every step, and this motion may be in addition to the lateral rolling before named; or the patient may be so placed that his head is lower than his feet, or his body may be unevenly supported, in either of which cases the ill results of the movements just described will be felt with more severity. The conveyance again may be raised so high that the patient upon it may be kept in con-

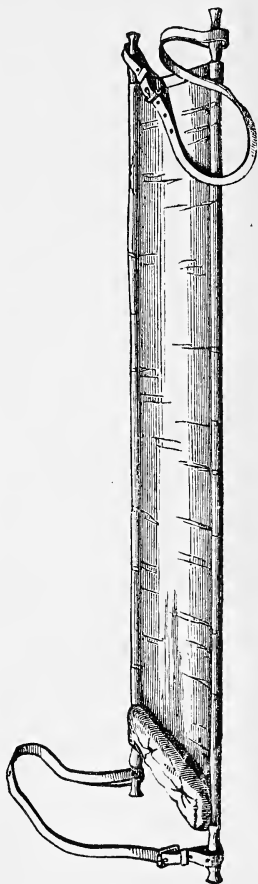


FIG. 22.

stant apprehension of falling off; or, in case of one of the bearers accidentally stumbling and allowing the conveyance to fall, he may receive such additional injuries as to lead to serious consequences. All these objectionable movements and wrong positions, which would be irksome enough to men in sound health, entail serious suffering and risks to men who are worn by illness, or who are labouring under fractures of bones or other severe wounds. Fortunately this suffering may be in a great degree prevented by a systematic observance of the rules hereafter mentioned, whatever the circumstances of the locality, or whatever differences there may be as to height or strength among the bearers.

One of the first things to impress upon bearers is that every movement of a man who is just wounded must be made with considerable care and gentleness, to prevent pain and aggravation of his injuries. Care when raising him from the ground where he has fallen, when placing him upon the stretcher, when lifting the stretcher with the patient upon it, when halting and laying it down for the purpose of resting. In each of these cases care is as essentially necessary to obviate suffering and additional mischief, as is a properly regulated step during the transport itself.

Very particular care is required when the patient has had a bone recently shattered by gunshot. The proper manner of accomplishing the delicate task of lifting and removing a man with such an injury, the various modes of protecting the broken limb during the transport, are subjects in which all bearers of wounded require to be specially instructed.

But it is not only in *recent* wounds that a disciplined system of proceeding is necessary for bearers; it is equally

requisite, if not more so, for those which have passed the recent state. Great as the torture is of wounded men, when they are carried badly shortly after their wounds have been received, the torture is greatly aggravated under the same circumstances after inflammatory action has set in. Nature then increases her demands for rest and quiet in order that the processes of repair may go on, and by every means in her power makes the demand known. Interfere with her under these circumstances, and she resents the interference, not simply by the infliction of pain, but, if the interference be great, by pain that is past expression, and, if sufficiently prolonged, by pain that is past endurance, for the sufferer will succumb under its overpowering influence.

Bearers.—It is usual in the British Service to tell off only two men to every stretcher. For several reasons, however, it is most desirable that three men should accompany every stretcher which is to be used for carrying wounded from the field of action. The third bearer is required in case of either of the other two bearers becoming wounded, to act as a relief to the bearers during the transport, and to assist in placing upon the stretcher men who have been rendered quite helpless by their wounds, especially those who have met serious fractures of bones from gunshot. For these latter cases the presence of a third bearer is of essential importance. A patient with a fractured thigh or leg should never be lifted up and put on a stretcher by two bearers only, unless under extreme urgency. The position of patients after they are on the stretcher, too, both on starting and during transport, frequently requires rectification, owing to the bellying of the canvas after they are lifted up, or to the effects of movement during the carriage, and this can only be done,

without laying the stretcher down on the ground, when a third bearer is present.

The bearers told off for carrying a stretcher must be severally distinguished by some ready appellation, and one must take the direction of all the duties connected with the transportation of a patient. The bearer who marches foremost is usually designated the front or No. 1 bearer; the one who is behind, the rear or No. 2 bearer. If a third bearer is told off to assist in the transport, he is designated No. 3 bearer. The rear or No. 2 bearer must assume the direction, for his position enables him to see, not only the patient on the stretcher, but the front bearer also, while the front bearer cannot see either, but only the ground or other objects before him.* There are certain parts of the transport which should always be conducted by short words of command. These are especially the lifting up and placing a wounded man on the stretcher, the start, and the laying down the stretcher. The object is not so much to ensure the alert and sharp movement which is required in military exercises, as it is to ensure, without loss of time, the necessary caution, steadiness, and well-concerted action of the bearers.

Every bearer should be able to take the duty of No. 1, 2, or 3 bearer at any moment his services may be required in either capacity.

Placing the Stretcher.—Before attempting to remove a badly wounded man from the spot where he has fallen, the stretcher should be brought close up to him; the wounded man should not be carried by hand farther than can be avoided. In placing the stretcher for this purpose, *it should not be laid by the side of the patient*, but at his head, and

* If one of the bearers be a non-commissioned officer, he should take command of the party, and he may take the position of either No. 2 or No. 3.

should not be placed crosswise, but the length of the stretcher should be in the same direction as that in which the wounded man happens to be lying. If placed by his side, it interferes with the movements of the bearers, and is liable to cause them to stumble when they are depositing the patient upon it. If placed crosswise at the patient's feet or head it leads to the necessity of the bearers turning round, and again causes the risk of one or other of them falling over the side poles. These objections are avoided by the stretcher being placed longitudinally, the patient is readily carried head forward over the canvas on which he is to lie, and the bearers move with a clear view of the stretcher before and between them, until the patient's head is directly over the pillow on which it is to rest.

Placing a Patient on a Stretcher.—As soon as all essential preliminary attention to the general condition of the patient, or to the particular injury he has received, the necessary prevention of movement of a limb, if a bone be broken, by any available support at hand, the preparation of stays or supports on the stretcher itself, if needed for the injured part, by arranging the man's clothing or accoutrements for the purpose, and all other such matters, which, it is presumed, the sick bearers are familiar with, have been attended to, the next proceeding is to place the patient on the stretcher.

No. 2 bearer gives the word "Fall in."

At this command Nos. 1 and 2 take up a position on opposite sides of the patient, near his haunch bones, facing each other, and No. 3 near to and facing the injured part.

No. 2 now gives the word "Ready."

At this all stoop down, Nos. 1 and 2 gradually get each one hand under the back of the patient, near the shoulder blades, and lock them, their other hands being passed, and

clasped, under the upper part of his thighs, as close to his breech as possible, while No. 3 supports and gives his undivided attention to the injured part. The word "Lift" follows.

At this word all the bearers, having secured a firm grasp, acting together, slowly rise from the stooping posture, and, bringing their knees together, stand up.

As soon as the erect position is gained, the word "March" is given.

The bearers march until the patient is exactly over his place on the stretcher, that is, with his head directly over the pillow on which it is to rest, and the order "Halt" is given, followed by "Ready," at which the bearers are to stop and get into a position in which they can lower the patient.

The word "Down" being then given, the patient is carefully lowered, each bearer at the same time dropping slowly into the stooping position, and deposited upon the stretcher.

Starting to carry a Stretcher.—The start in every instance will be best accomplished by dividing the action into four parts, and assigning to each its distinct word of command. As soon as the patient is properly settled upon the stretcher which is lying upon the ground, No. 2 bearer gives the word "Fall in." At this command No. 1 and 2 bearers get into their proper positions at the head and foot of the stretcher, and No. 3 by the side of it. As soon as this is done, No. 2 bearer gives the word "Ready." The two bearers at once adjust the ends of the shoulder straps, and take hold of the handles of the stretcher-poles. This being done, No. 2 bearer gives the word "Lift," and immediately the two bearers raise the stretcher steadily together. No sooner is the stretcher raised, and all is seen to be right,

than the word "March" is given by No. 2 bearer, and both bearers at once move off.

Halting with and laying down a Stretcher.—In like manner, when the stretcher is to be lowered and placed on the ground, it will be best done by corresponding divisions of the action and words of command. No. 2 bearer calls "Halt," at which both bearers stop, but without any abrupt or sudden jerk; the word "Ready" is then given, which is the signal for getting into position to stoop; the word "Down" follows, when the stretcher is lowered, and laid gently on the ground; and lastly, at the word "Fall out," the two bearers quit their hold of the handles and move away from the stretcher.

Marching with a Stretcher.—The front and rear bearers of the conveyance must start with opposite feet. They must not move "in step," but, on the contrary, must march out of step, or, as the ordinary expression is, must "break step." If the man in front step off left foot forward, the man in the rear must step off at the same moment right foot forward, and this broken step must be maintained throughout the whole distance of the transport.

The reason which dictates the rule named is readily apparent on examination. If two men carrying a stretcher between them keep step in starting as a front and rear rank soldier do in commencing to march, that is, if both men advance their right feet together, there must at the same time be an inclination of the body of each man towards the same side in proportion to the distance to which his foot is advanced, and equally so of the stretcher which they are carrying. When next the left feet are advanced together, the inclination will be changed from the right to the left side, and the alternate change of inclination will be unavoidably communicated to the

wounded man lying upon the canvas stretcher, and will be continued so long as the step is kept. The wounded man is placed in much the same circumstances as regards this kind of movement as a man who is riding on a camel, instead of being, as he should be, in the position of one on the back of a horse when the animal is walking. But when the step is broken at starting, that is, when the front rank man advances his right foot, and at the same time the rear man advances his left foot, as the horse does his opposite feet, the dipping motion down to either side is avoided, and the surface of the stretcher is maintained on a horizontal plane. With each step of the bearers there is a moderate upward and downward movement of the stretcher, chiefly owing to the pace and the elasticity of the side poles, but with this exception the general level is preserved. There is no lateral movement, giving the patient a tendency to roll from side to side.

The rule equally applies if the stretcher be carried by four instead of by two men. The step must be broken by the front and rear rank men, so that the level of the stretcher may still be preserved.

In carrying a stretcher the pace should not be so long as it is in marching in the ranks, and the movement of the lower limbs should be conducted on different principles. When a combatant recruit is under instruction, he is taught, in practising the balance step, which forms the foundation on which the art of marching is built up, that the knee should be kept stiff, and the whole limb straight, when it is either advanced in front or extended behind. The movements of his lower extremities are all to be from his hips. The toe of his foot is to be advanced, and foot brought to the ground at thirty inches distance, measured by the pace-stick, from heel to heel. This is the slow

step; in stepping out the pace is lengthened to thirty-three inches. In the ranks, not only is length of stride and consequent speed of movement gained by this proceeding, but it enables an uniform pace to be preserved with bodies of troops. At the same time the length of the marching stride and the movement from the hips unavoidably induce an upward and downward movement of the parts of the soldier's body above the hips. The trunk sinks as the foot is advanced; it is raised as the limb is again brought vertically under it. This alternate elevation and depression is sufficiently manifest to any one who observes a line of troops advancing towards him, or, more conspicuously still, if they are moving on the other side of a hedge with only the upper parts of their bodies exposed. The kind and length of the pace just described will not answer so far as stretchers are concerned, if they are to be carried to the best advantage. The gait of the hawker who habitually carries a basket of crockery, or of a man carrying a bucket of water, on his head, is the most suited to the circumstances of a patient carried on a stretcher; for with such a gait the trunks and arms of the bearers, and consequently that which they are carrying, are least lifted up or moved. The peculiarity of this gait is, that in it the hip-joints are used as little as possible, the advance is made with the knees kept bent, and the step is shorter. The knees are never wholly straightened, as in marching. The length of the pace is about twenty inches. This is the kind of gait which is assumed by the native dhooley-bearers in India when they are carrying sick, and is the most effective for stretcher-bearers too, when trying to prevent undue movement of the stretcher.

The difference in the rise and fall of the upper part of the body between a pace of 30 inches and a pace of 20

inches, is greater than might be suspected. When two men holding a stretcher without a man upon it make together a pace of 30 inches, measured from heel to heel, the dip of the stretcher is $3\frac{1}{2}$ inches; with a man upon it, the arms being then stretched to the full by the weight, the dip is $4\frac{1}{4}$ inches. When the pace is 20 inches, the dip, without a man upon the stretcher, is only $1\frac{1}{2}$ inches; with a man, $2\frac{1}{4}$; or about one-half of the dip in the longer pace. Of course, in marching at either pace there is an alternate rise and fall to the same extent, and the effect of this on the elastic poles of a stretcher can readily be imagined. The extent of elevation and depression which has just been mentioned is irrespective of jerking or any other movement, having been carefully measured when the bearers were standing still at each position.

There is another difficulty in applying the ordinary marching step to men engaged in carrying stretchers. The position of the traverse causes it, with a pace of 30 inches, to press very severely, especially an iron traverse, upon the front and upper part of the advanced thigh of the rear or No. 2 bearer. The traverse also touches the back of the rear thigh of the front or No. 1 bearer; but, as the motion of this limb is away from the stretcher, it does not cause any marked inconvenience. The result is, that in trying to march with a pace of 30 inches, the rear bearer is subjected to a sharp blow from the traverse on one or other of his thighs, at every step. A jolt is also, at each contact, communicated to the stretcher and patient upon it. With a pace of 20 inches, the traverse being placed, as it is in the regulation stretcher of the British Service, at a distance of 7 inches from the ends of the handles, the thigh of the rear bearer is just cleared, and no impediment in this respect is given to the forward motion.

The bearers must march with a steady but easy step, particularly avoiding elevation of their bodies by springing from the fore part of the feet. The foot should be planted without any wavering on the ground at each step, and in moving forward it should only be raised sufficiently to clear the ordinary impediments on its surface. Some bearers, unless this rule is enforced, will make a slight spring in their movements, which spring is of course communicated to the more or less pliable conveyance they are carrying. They do so in the belief that the weight is sustained more easily in consequence of the elastic movement which is thus obtained, but they take no note of its ill effect on the person conveyed.

Whether even or uneven as regards measure of time, great care *must be taken* that the steps of the front and rear bearers are invariably *even and alike in distance*. If the steps do not well and accurately agree in length, there will constantly be a hasty "catching up" of one or other of the bearers; and the stretcher and patient will be jolted on every occasion when an effort is thus made to re-adjust the distance. If the bearers march with an exactly corresponding step as regards length, this source of disturbance will be avoided.

The same words of command are used in bearing a patient from the stretcher.

RULES AND CAUTIONS.

1. When distributing bearers, as far as circumstances permit, men nearly of the same height and strength should be selected for acting together. When a stretcher is supported by men of equal height and proportion, if the ground be level, the stretcher will necessarily assume a horizontal

position also, and men possessed of like degrees of strength will carry the weight and move together more evenly. If the ground be uneven, the bearers will have to mutually adapt the height of their respective ends of the conveyance to the irregularities, in order to preserve its level condition.

2. When braces or shoulder-straps are used to assist the bearers in carrying stretchers, care should be taken at starting that they are buckled so that the parts supporting the poles are all at equal distances from the *surface of the ground*.

3. As most ground over which wounded have to be carried is likely to present irregularities of surface, it becomes an important matter for bearers to practise the carriage of stretchers, so as to acquire a facility of keeping the stretcher level, notwithstanding the ground is uneven. Bearers trained and habituated to this duty perform it with ease and dexterity, irrespective of differences in their own respective heights; while those who have not practised it are not unlikely to cause considerable distress to the person carried, when they have to carry him up and down hill, in consequence of their deficient training. A concerted action of the front and rear bearers is necessary, and each must be aware what part he is to perform, according as the end of the stretcher at which he is placed is rendered higher or lower by the unevenness of the surface over which they are passing. The act can readily be acquired by practising the carriage of the litter up and down steps. In this practice the front and rear bearers should occasionally change their respective positions. A bearer should also be carried on the litter in turn, so as to be made practically aware of the effects of even and uneven carriage.

4. If the ground over which the conveyance has to pass present a general ascent, and the bearers be of different

heights, then the rear or No. 2 bearer should be the taller and stronger man; for his greater height, and the greater strength of his arm, will be useful in supporting and raising the stretcher up to the level of the end carried by the foremost man. The weight of the stretcher will naturally be thrown in the direction of the man on the lower level.

5. If the ground present a general descent, the front or No. 1 bearer should be the taller and stronger, for the same reasons as those just given as regards the No. 2 bearer, under the opposite circumstances, as mentioned in Rule 4.

6. A sick or wounded person on a stretcher should be carried, if the ground be tolerable level, with his face looking towards the direction in which the bearers walk. The front or No. 1 bearer then supports the end of the stretcher at which the patient's feet are placed; the bearer near the patient's head is the rear bearer.

7. If the bearers have to carry the stretcher up hill, the front bearer should support the end of the stretcher on which the patient's head is placed, excepting in the case mentioned under Rule 8.

8. If the bearers have to carry the stretcher down hill, the rear or No. 2 bearer should support the end on which the patient's head is placed. The reverse position should be assumed by the bearers, both as regards going up hill and going down hill, in case the patient being carried is suffering from a fracture of the thigh or leg. With regard to this exception, a reverse position of the patient is given to prevent the weight of his body pushing the upper end of the broken bone down upon the helpless and motionless portion of the limb below the seat of fracture. Although under all circumstances the level position should be sought for as much as possible, still, if the slope of the ground be such that it cannot be attained, it appears desirable that

the inclination downwards should be towards the feet rather than towards the head of the patient.

9. Never attempt to carry a helpless patient over a high fence or wall, if it can possibly be avoided ; it is always a dangerous proceeding. The danger is of course increased in proportion to the height of the wall or fence ; but, even if the wall be not much higher than one over which the bearers can step, the stretcher must be made to rest upon it, to the inconvenience and probable pain of the patient, while each bearer in succession gets over the obstruction ; and it is better to avoid even this inconvenience, provided the avoidance does not entail great delay. If the fence or wall be high, either a portion of the wall should be thrown down, or a breach in the fence made, so that the patient may be carried through on the stretcher ; or, if this be not readily practicable, the patient should be carried to a place where a gate or opening does already exist, notwithstanding the distance to be traversed may be increased by the proceeding. It is better that the transportation should be somewhat delayed than the safety of the patient's limbs or life risked.

10. In crossing a ditch, dyke, or hollow, the stretcher should be first laid on the ground near its edge. The first bearer then descends. The stretcher, with the patient upon it, is afterwards advanced, the first bearer in the ditch supporting the front of the stretcher while its other end rests on the edge of the ground above. While thus supported the second bearer descends. The two bearers now lift the stretcher to the opposite side, and the fore part being made to rest on the edge of the ground, while the rear part is supported by the second bearer in the ditch, the first bearer is left free to climb up. The stretcher is now pushed or lifted forward on the ground above, and

rests there, while the second bearer climbs up. The two bearers then carry the stretcher on.

11. On no account should a stretcher be permitted to be carried on the shoulders of two or four bearers. The evil of such a proceeding is, not only that it is difficult to find several bearers of precisely the same height, so that a level position may be secured, but also that the wounded or sick person, if he should happen to fall from such a height, owing to the helpless condition in which such a patient usually is, is not unlikely to sustain a serious aggravation of the injuries he may already be suffering from. Moreover, one of the bearers of a stretcher ought always to have his patient in view, so as to be aware of hæmorrhage, fainting, or other change requiring attention, taking place, and this cannot be done when the patient is carried on the shoulders. The height, too, is calculated to cause the patient uneasiness and fear of falling off, which it is also desirable to avoid. For all these reasons, notwithstanding that bearers will often attempt to carry a patient on a stretcher upon their shoulders, from the weight being borne more easily in that position, or with a view of relieving a fatigued condition of the arms, the practice should be strictly forbidden.*

CARRIAGE OF STRETCHERS ON WHEELED SUPPORTS.

Stretchers, instead of being carried as just described, may be placed on wheeled supports and wheeled along, thus saving labour.

The supports are of various kinds in different countries. That likely to be adopted in the British Service is what is known as "Shortell's Wheeled Stretcher Support," and shown in the sketch on the next page.

* Taken from Professor Longmore's "Treatise on the Transport of sick and wounded."

Description of Shortell's Wheeled Support.—The wheeled support consists of the following distinct parts, separable from one another :—An axle, two wheels, and two springs.

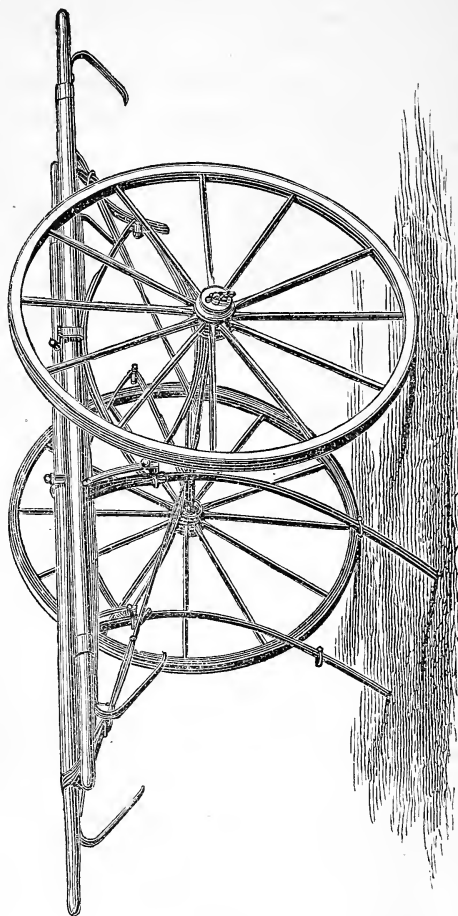


FIG. 23.

The axle is made of iron. Its length from end to end is thirty - six inches, and between the arms twenty - six. It is rounded for twelve inches in the centre, and has projecting from the middle of this rounded part two ears, to each of which is attached a strap. Between the rounded part and each arm is a quadrangular portion, on which fits the socket of each spring. At the end of each arm is a linchpin, permanently attached by a chain.

The straps attached to the axle are strong leathern straps, four feet and

a half long, each furnished at its free end with a buckle and several eyelet holes. They are used for securing the stretcher to the support, by being buckled round the traverses, and also for binding the different parts of the appliance together when packed for stowage.

The wheels are of wood. Iron, however, seems to be preferred, and will most likely be adopted. They have a diameter of thirty-seven inches.

The springs are two, of the double elliptic pattern. On the under surface of each is a socket of dimensions, suitable for sliding easily over the arms of the axle and fitting on the quadrangular part already described, where it is secured by a thumbscrew. On the upper surface of each spring is a crutch for the reception of the stretcher pole. To the outer arm of the crutch a flat bar is hinged, with a slit hole near its free end, into which a button, fixed on the inner arm of the crutch, fits.

To one end of each spring is attached a foot by a peculiar contrivance, which acts as a hinge, and also as a support for the pole of the stretcher to rest on when the feet are in use. The feet are raised and brought up close to the stretcher when the conveyance is being wheeled.

The support is made to receive almost any kind of stretcher.

Packing for Stowage.—The feet are set free from the buttons, and turned back along the upper side of the springs, lying within the crutches, which receive the stretcher poles. The wheels and springs are then taken off the axle, one wheel is laid on the ground, one spring placed on the top of this, the axle laid in the spring, the other spring on the axle, and the second wheel on the top, and lastly the whole secured by lacing the straps at the four points where the springs, axle, and spokes cross each other.

Thus a circular package is formed thirty-seven inches in diameter and nine inches thick.

Preparing for use.—The sockets of the springs are slid over the arms of the axle on to the quadrangular portions within the arms, so placed that one is apart from the other the breadth of the stretcher to be carried, and locked in their places by the thumbscrews. The wheels are then put on the arms, first slipping the linch-pin and chain through the box in the nave. This will be most easily accomplished by inclining the wheel to the outside, and while in this position dropping the linch-pin through the box. The feet are now turned down, and, being secured by the button provided for the purpose, the springs rest upon them, and are thus kept in an upright position to receive in their crutches the stretcher poles; and next the cross bars of the crutches are opened.

Placing a Stretcher on the Support.—The bearers, having placed the patient on the stretcher in accordance with the directions already given, lift it and march alongside the support until the centre of the stretcher is opposite the centre of the adjoining wheel. The word "Lift" is then given, at which the bearers lift the stretcher over the wheel and bring its poles over the springs; "Ready" follows, at which the centre of the poles, where the gaps are left in the canvas, are brought directly over the crutches; "Down" is then given, and the stretcher poles are lowered into their places.

The stretcher being thus placed on the support, each pole is fixed in its crutch by the small cross bar and button, and the straps attached to the axle are buckled round their respective traverses.

One of the bearers now lays hold of the stretcher handles at the end next which the feet of the support are placed,

raises and secures each foot in succession in its place, and wheels the conveyance, pushing it in front of him.

The support with the stretcher on it is meant to be lifted over ditches and other places over which it cannot be wheeled, and the directions given in the "Carriage of Stretchers" are here applicable.

CHAPTER VI.

THE REMOVAL OF SICK AND WOUNDED BY IMPROVISED METHODS WHEN NO STRETCHERS OR REGULAR CONVEYANCES ARE AVAILABLE.

WHEN no stretchers or other regular means of conveyance are available, patients may be transported for short distances by one of the methods given by Professor Longmore.

The following are his directions in a condensed form.

There are various methods by which the transport of a wounded man who is too weak to walk alone to the rear for surgical assistance, may be effected by trained attendants when no litter or conveyance is disengaged or near at hand for use.

Assistance when only one Attendant is available.—If the wound be in the head, neck, or upper part of the trunk the patient should support himself by his musket in one hand, used as a walking stick, while his other arm and hand lean upon the upper part of the back and distant shoulder of the attendant, who walks by his side. At the same time, the attendant should place his near arm obliquely across the back of the wounded man, reaching round and partially encircling the body with his forearm and hand, taking hold of the patient with the latter above the haunch, so as to assist in supporting and keeping erect the upper part of the patient's trunk.

The same position of the patient and attendant will answer when the wound has been inflicted on any part of the upper or lower extremity; after proper temporary protection has been applied to the injured limb. If the wound be in the lower extremity, the patient will be enabled, by such assistance, to walk without throwing the weight of the body upon the foot of the injured side, or may hop along with less exertion and fatigue. If it be in the upper extremity, the patient will not be able to avail himself of any support which requires to be held in the hand, but the injured arm should be slung in a handkerchief, so arranged as to fully support it.

If the upper extremities be uninjured as well as the thighs, and the attendant be strong enough, he may take up the patient on his back and so carry him to the hospital. In this case the patient places both arms round the neck of the attendant, while the attendant supports with his own arms on either side the corresponding thigh of the man he is carrying.

CARRIAGE BY TWO BEARERS.

First method. Two-handed Conveyance for Patient sitting.—He may be carried in a sitting position by the two bearers joining two of their hands beneath his thighs, close up to the buttocks, while their arms which are not thus occupied are passed round his loins in the manner shown in the illustration. (See fig. 24.)

In this instance the fingers of the left hand of one of the bearers are locked with the fingers of the right hand of the other bearer, and a seat so formed. The patient, if he be able, helps to support himself by clasping the bearers with one or both arms.

The same words of command may be used in lifting a patient by this method which are used in lifting a patient on a stretcher.

Second method. Two-handed Support for Patient semi-recumbent.—The advanced right and left hands of the two bearers are closely locked together, and the wrists brought



FIG. 24.—Two bearers carrying a wounded man between them.

into contact, not merely the fingers interlaced, so that a firm junction of both hands is established. At the same time the other hands of the two bearers are made to rest upon and in a certain degree to grasp each other's shoulders on the same side respectively. When a patient is carried according to this method, the weight of the patient falls chiefly upon the two arms behind, but to some extent also upon the chests of the two bearers, while that portion of the weight which falls upon the arms in

front does not bear upon the fingers and hands so much as in the former case, but is distributed over the forearms and shoulders. The patient is not carried in a sitting posture but lying back. It is therefore well adapted for removing a patient who is so weak as absolutely to require complete support at the back to prevent him from falling, or who is quite helpless, or who is disabled in both upper extremities. It is not so easy for two bearers to assume the relative positions just described when they have to pick up a patient lying upon the ground as it is to take the former one, but they

may easily pick the patient up by the first method, and change to this method.

If the bearers are untrained in this respect, it will be better, if it can be done, for them to stand in the position shown in the drawing (see fig. 25), while two other bearers lift and place in their arms the patient who is to be carried away.

Third method.

Four-handed Seat with crossed Arms.

—If a wounded man be able to sit upright, and is able to assist in holding himself up by his own arms, the bearers may then employ all their hands and arms in forming a seat for him. This is sometimes done

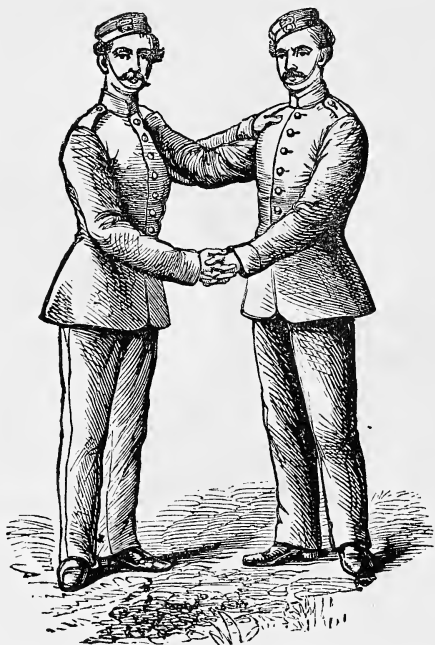


FIG. 25.—Two-handed support by two bearers for carrying a patient in a semi-recumbent position.

by the bearers crossing their arms and then grasping each other's hands. A space is thus left between the bearers' hands and forearms upon which the patient may be supported for a time with tolerable security.

Fourth method. Four-handed Seat with uncrossed Arms.—A better way of effecting the removal of a wounded man,

if he is able to be transported on all four arms of the bearers, is represented in the following drawings. (See figs. 26 and 27.)

This mode of forming a seat is known among school-boys as the sedan chair; and it is remarkable how well the weight of a person sitting is borne when the hands and

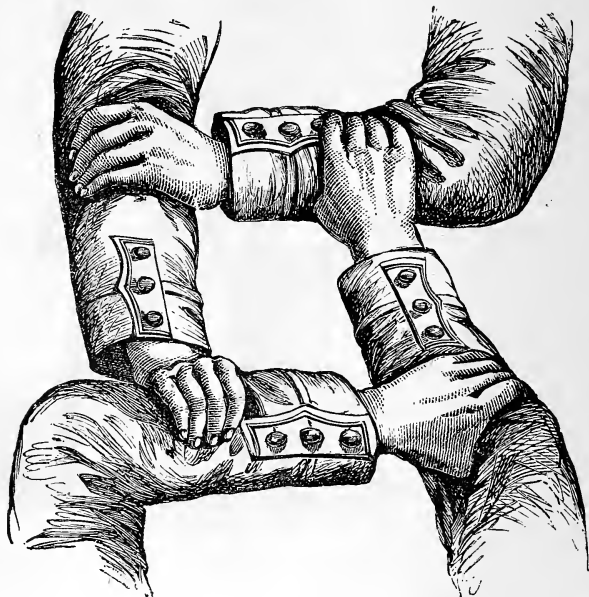


FIG. 26.—Four-handed seat formed by two bearers, the arms being uncrossed.

arms of the bearers are so placed. The arrangement, moreover, forms a very easy seat for the person carried, and a very secure one also if he is in a state to give himself the necessary additional support by placing his arms over the shoulders of the bearers.

As seen in the drawing, the backs of the bearer's hands

are turned uppermost, while the palms rest on the adjoining arms. Each forearm, near its middle, is grasped by a hand, and each hand in its turn holds in its grasp the next arm, which is placed at right angles to it. They thus mutually support each other and are mutually supported.

Directions.—No. 1 bearer stands on the left side, No. 2 on the right. No. 1 bearer grasps with his right hand the left arm of No. 2 bearer, No. 2 bearer grasps with his left hand his own right arm, No. 2 bearer then grasps with his right hand the left arm of No. 1 bearer, No. 1 grasps with his left hand his own right arm. This being done, the connection is complete. Or Nos. 1 and 2 bearers may be directed each severally to grasp with his right hand his own left arm, and, when thus ready, to grasp each other's arms with the unoccupied hands. It is difficult to pick up a patient lying on the ground, but the patient can easily be lifted up by the first method, and standing him

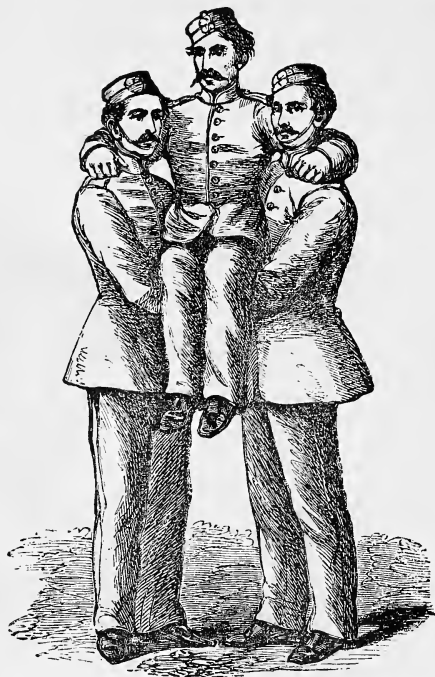


FIG. 27. — The bearers marching with patient.
(Front view.)

against one of the bearers, change to this seat, or other bearers may lift him on to the seat when formed.

Fifth method. Three-handed Seat and back Support.—The three-handed seat is formed in the same way as the four-



FIG. 28.—The bearers with three-handed seat and back support formed.

handed seat last described, so far as the position of the three hands and the mutual support given to them are concerned. A triangular instead of a quadrangular seat is formed for the patient. (See fig. 28.)

The hand which is left disengaged is then made to rest on the adjoining shoulder of the other

bearer, so that the arm forms a back as it were to the chair.

Carriage of Wounded on Muskets or other convenient articles.—Instead of either of the plans just described, a temporary substitute for a seat is occasionally formed by some article of convenient size and length which happens

to be at hand being held horizontally between the two bearers, and thus converted into a means of support.

One or two muskets may be employed in this way. A great coat or blanket is rolled round the musket, or two muskets placed side by side, all secured by a couple of straps or handkerchiefs. The patient sits on this support, and places his two arms, if neither be wounded, over the shoulders of the bearers between whom he is carried. If any belts or other articles can be got, to answer the purpose of shoulder straps, the muskets can be carried with greater facility and less fatigue by the bearers, while their hands can be from time to time employed in giving additional support to the wounded man whom they are transporting.

CHAPTER VII.

THE TRANSPORT OF SICK AND WOUNDED BY MEANS OF MULE-LITTERS.

Description of Litters.—Litters are carried on mules, and are for the transport of sick and wounded in the recumbent position.

The litters described below are of the latest French pattern.

Each litter complete consists of the undermentioned parts :—

1 iron framework, jointed, in three parts—head piece, centre piece, and foot piece.

4 pins, with straps, for fixing joints.

2 iron hood rods.

1 foot rail.

2 cross bars.

2 uprights.

2 sling hooks.

2 straps for belly straps and back suspension strap.

1 hood strap.

2 side straps.

2 bellyband straps, long and short. } Common to both
1 back suspension strap. } litters.

1 canvas bottom, with eyelets and rope lacing.

1 pillow.

1 cover, with straps and buttons.

Weight 82 lbs.

Litters are suspended by pairs from the pack-saddle of a mule; but, unlike cacolets, they cannot be used indiscriminately for either side. They are therefore distinguished as right and left.

Owing to the greater strength and height of the mule at the shoulders the patient is carried head foremost, with his feet towards the hinder part of the animal.

The framework of the litter is made of iron, and jointed into three principal parts—head, centre, and foot pieces—for the purpose of folding up when not in use. These joints are fixed by pins.

In order to secure a patient from slipping downwards beyond the end of the litter, in the most recent French patterns a small foot rail is added to it.

To prevent rolling off on the outside a double side rail is placed along the middle compartment of the litter.

The head part of the litter is always raised a little, and, in addition, the pillow obviates any tendency on the part of a feeble patient to slip in that direction.

When required for use the litter is laid on the ground and the wounded man placed upon it. As soon as he is settled in his place the litter is raised by three men to a level with the saddle, hooked on, and securely fixed in its place.

A long strap is made to pass from the upper bar of the outer side rail of one litter, over the patient upon it, and over the pack-saddle, to the corresponding rail of the other litter. This strap holds up the two litters, which would otherwise, by their breadth and the weight upon them, have a tendency to dip downwards at their outer margins.

Another strap passes from the lower part of the outer side rail, under the litter; the belly of the animal, and under the other litter, to be buckled to the lower part of its side rail, and a third passes from the inner side rail of one

litter to the inner side rail of the other litter, also under the belly of the animal.

The combined influence of these three straps is to prevent the two litters swaying up and down during the movements

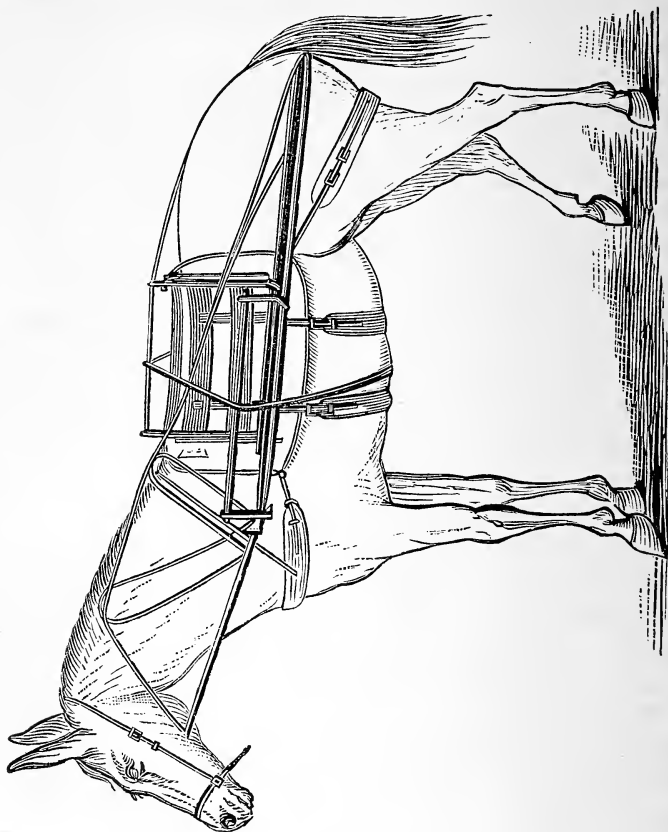


FIG. 29.—Mule litter attached to its pack saddle.

of the animal, and thus to lessen the disturbance which would be caused to the patient's lying upon them. (See fig. 29.)

Management of Litters.—With each mule for the carriage of litters should be a driver, whose duty it is to attend to the animal, harness it, and drive it.

Four orderlies or bearers are required to load and unload litters. They are named respectively Nos. 1, 2, 3, and 4 bearers.

Loading Litters.—When about to load litters the joints should first be fixed by means of the pins attached for that purpose, the cover of each unbuttoned on the outside and neatly rolled along the inside of the litter, the hood rods lowered, the strap being laid along the rolled cover. The litter is then brought to the spot where the patient to be transported is lying and placed on the ground, with the foot piece touching his head (or alongside the patient if he is himself able to get into it without being lifted).

Nos. 1, 2, and 3 bearers lift the patient and place him upon the litter in the manner already described for placing a patient on a stretcher, taking care in doing so to avoid contact with the sling-hooks.

No. 2 bearer now gives the word "Fall in."

At this command No. 1 takes up a position on the inside of the foot piece, No. 2 on the inside of the head piece, No. 3 on the outside of the centre piece, all facing the litter, and No. 4 on the opposite side of the saddle and mule.

At the word "Ready," Nos. 1 and 2 take hold of the side of the litter each with one hand, and of the hook-sling with the other hand (the hand on the outside and the thumb downwards, to avoid its being crushed between the saddle and the sling), and No. 3 of the framework of the centre piece with both hands.

At the word "Lift" the litter is raised by Nos. 1, 2, and 3 bearers and placed on their shoulders, No. 3 passing one hand underneath the litter and taking hold of the

inside of the framework, while Nos. 1 and 2 each retains his hold of the hook-slings.

At the word "March," the litter is carried alongside the mule, with the head towards the animal's head, until the centre is opposite the centre of the saddle.

At the word "Ready," Nos. 1 and 2 guide the hook-slings into a position to slip on to the saddle hooks, while No. 4 takes hold of the saddle on the opposite side to prevent its turning.

At the word "Down," by a simultaneous action of the three bearers, the sling-hooks are lowered into the saddle hooks.

"Fall out" is then given. No. 3 remains, bearing up the loaded litter, but Nos. 1 and 2, joined by No. 4, proceed to place the patient upon and affix the second litter as just described. This done, Nos. 3 and 4 continue to support the litters, while Nos. 1 and 2, one on each side of the mule, affix the straps, commencing with the back suspension strap. The hood rods should now be raised, their straps attached at the foot rails, and the covers pulled over and buttoned.

Unloading Litters.—When about to unload litters the cover of each should be unbuttoned on the outside and rolled along the inside of the litter, the hood straps loosened and the rods lowered, and the belly straps and back suspension strap unbuckled.

At the word "Fall in," No. 1 bearer takes up a position on the inside of the foot piece, No. 2 on the inside of the head piece, No. 3 on the outside of the centre piece, of the litter which is to be first unloaded, and No. 4 on the outside of the centre piece of the opposite litter.

At the word "Ready," each bearer places his shoulder under the litter, Nos. 1 and 2 taking hold of the hook-slings

each with one hand, and Nos. 3 and 4 each passing one hand under the centre piece of his own litter and taking hold of the inner side of its framework.

At the word "Lift," all raise the litters until sufficiently high for Nos. 1 and 2 to slip the hooks of their litter off the saddle hooks.

At the word "March," the litter is carried to its destination. "Halt," and "Ready," follow, with the action to suit; and the word "Down" then being given it is steadily lowered from the shoulders and placed on the ground.

Nos. 1 and 2, aided by No. 4, then proceed to unload the other litter in a similar manner.

If there be six bearers present three should go to each litter, and place both on the pack-saddle at the same moment.

When the litters are not required to carry sick or wounded, the pins being removed, they should be folded up close to the sides of the saddle.

Patients of as nearly equal weights as possible should be carried on a pair of litters, and where a choice exists the strongest mules should be selected to carry the heaviest patients, as it should be borne in mind that the following is the average weight carried by each mule:—

Pack-saddle complete	.	.	63 lbs.
Litters	"	.	82 "
Two patients, about	.	.	308 "
			<hr/>
Total			453 "

When a difference exists in the weight of the two patients to be transported, the heavier patient should lie towards the inner side of the litter, while the lighter lies towards the outer edge of his litter; but should the dispro-

portion in their weights be so great that this arrangement will not preserve the balance, a pack, rifle, or some other weight must be employed on the lighter side.

When patients with fractured limbs are being transported, every available means, such as straw, hay, or articles of clothing, should be used as padding to keep the limb in an easy position and to prevent movement.

CHAPTER VIII.

THE TRANSPORT OF PATIENTS BY MEANS OF CACOLETS, OR MULE-CHAIRS.

Description of Cacolets. — Cacolets are folding chairs, hooked one on each side of a pack-saddle carried by a mule or pony, with patients in the sitting posture.

Each cacolet consists of a seat, two hook slings, two uprights, a wooden footboard, two straps to sling footboard, a side rail, a back strap, a waist strap, and a cushion for the seat.

Each cacolet can, by a change in the back and footboard straps, be placed indifferently on the right or left side of the pack-saddle, and each forms a seat for one patient.

When the pair are secured in their places, the arrangement is such that two patients sit one on each side of the animal's sides, with their faces turned towards its head, and their feet supported on the cacolet steps just behind the animal's fore legs.

The main portions of the framework of the cacolet are made of wrought iron; but for certain parts, such as a circular band attached to the back support, by which the patient is secured from falling forwards, and some of the minor details, straps of leather are employed. The seat is covered with a leather cushion.

The foot support consists of a little plank of wood suspended by two straps which hang vertically down from the

front of the seat. The upright and horizontal bars of the framework are connected by hinged joints.

The whole conveyance when not in use can be folded up closely together, and turned up against the boards of the saddle, the footboard carried back and passed through the back strap, and the waist strap, which is attached to the back strap, carried over the pack-saddle and buckled to that of the opposite side ; and thus both cacolets are held in position, flat against the sides of the saddle in the hollow space between the extremities of the crutch and cantle. (See fig. 30).

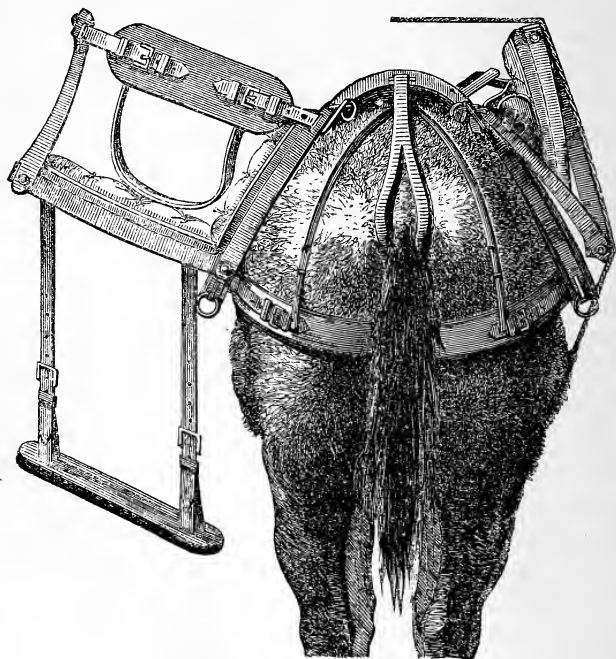


FIG. 30.—End view of mule chair or cacolet, open for use, and packed for travelling.

Management of Cacolets.—As patients are carried in cacolets in the sitting posture only, such only as are able to bear this mode of carriage are transported in this way.

Patients with fractures, or other severe injuries, of the lower extremities, are not suitable for this mode of transport, nor are very weak patients, who may become faint when placed in the erect position.

Two bearers, with the aid of the driver, are sufficient to load and unload cacolets, but if a third bearer be available, so much the better, as the driver can then give his undivided attention to keeping the animal steady.

Loading Cacolets.—The cacolets being hooked on to the buttons on the inner of the crutch and cantle of the saddle, the seat let down, and the straps properly arranged, using the words of command already given, Nos. 1 and 2 bearers, grasping each the other's hand under the patient's buttocks, while their arms which are not thus occupied are passed round his loins, form a two-handed seat in the manner described elsewhere, and thus lift and carry him, with his back towards the front of the cacolet, until they get into a proper position to raise him into the seat, while No. 3 bearer, at the same time, holds down the opposite cacolet.

This done, the two bearers proceed to lift the second patient in a similar manner into the other cacolet.

The waist straps should now be buckled round both patients, and their feet placed on the footboards, arranging the straps to the proper length.

To unload Cacolets.—The waist straps being loosened, two bearers, one at each side in front of the patient, place their hands in the manner described in loading, forming a two-handed seat, and thus lift him out of the cacolet, while a third bearer, or the driver, stands by to hold down the cacolet when the weight is taken off it until the first two

bearers are disengaged to lift the second patient out as they did the first.

In case of a difference in the weights of two patients carried in cacolets, it may be remedied in the manner described when speaking of litters.

The same remark will apply to the selection of the strongest mules to carry the heaviest patients, the average weight of a pair of cacolets loaded being

Pack-saddle complete	.	.	.	63 lbs.
Pair of cacolets	„	.	.	56 „
Two patients	„	.	.	308 „
				<hr/>
Total	.	.	.	427 „

CHAPTER IX.

THE TRANSPORT OF PATIENTS BY THE AMBULANCE WAGON IN USE IN THE BRITISH ARMY.

THE ambulance wagon is a four-wheeled spring vehicle, drawn by two horses and fitted with two seats, one in front and one behind, each for three patients. It also contains a basket for packs, straps for carrying arms and field stretchers, a water barrel, water bucket, a light operating table and fourteen stretchers, two of which are for the purpose of forming beds in the wagon for the transport of wounded, these are called "Ambulance Wagon Stretchers." (See figs. 32 and 33).

The ambulance wagon stretcher is double, the upper stretcher, upon which the patient lies, being supported upon another stretcher below, with intervening india-rubber springs. The upper stretcher is padded, covered with canvas, and sloping, being raised about four inches from the under stretcher at the head, and closely connected with it by hinges at the foot.

This inclination is given by the india-rubber springs, two sets of which, of different heights, are placed between the two stretchers. The bed of the upper stretcher is strengthened by a strong network of webbing, and the under stretcher is furnished with handles. Two small rollers, one before and one behind, are attached to each of

the side poles of this stretcher to facilitate its insertion into and removal from the wagon, on the floor of which it is

designed to be carried when in use.

The length of the upper stretcher is a little over six feet, the lower is of the same length with the addition of the handles, the width between the poles is eighteen inches. (See fig. 32.)

This stretcher is intended solely for use in the ambulance wagon, and is therefore not employed for carrying patients long distances, but on the arrival of a patient at the ambulance

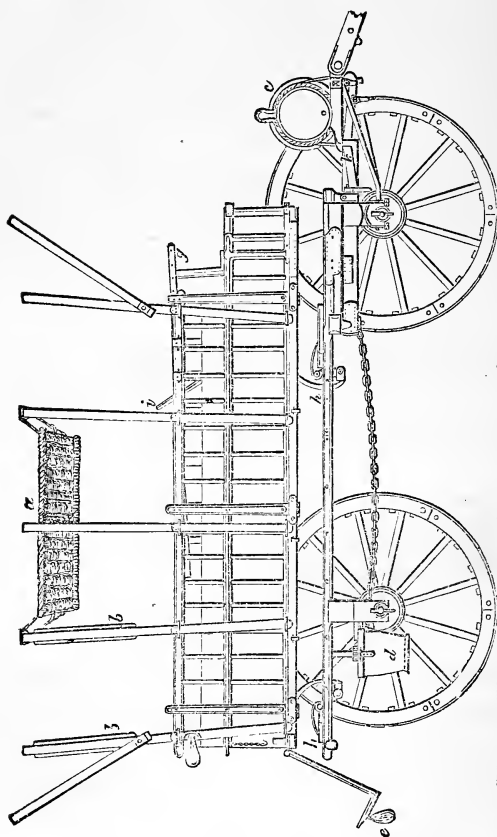


FIG. 31.*

* *a.* Basket for knapsacks; *b.* straps for firearms; *c.* water barrel; *d.* water bucket; *e.* apron; *f.* grease-tin; *g.* ladder; *h.* springs; *i.* seat; *k.* swingle tree.

wagon on an ordinary stretcher, he is transferred to the ambulance wagon stretcher for the purpose of being placed in the wagon.

When the patient has been placed on this stretcher, and carried to the hinder end of the wagon, the bearer at his feet should be ready to move round the end of the pole in his left hand, retaining, while he does so, the support of this pole only. Before he makes this move, however, No. 3 bearer must grasp the right-hand pole; the hold of it should on no account be given up by the first bearer until he has

FIG. 32.

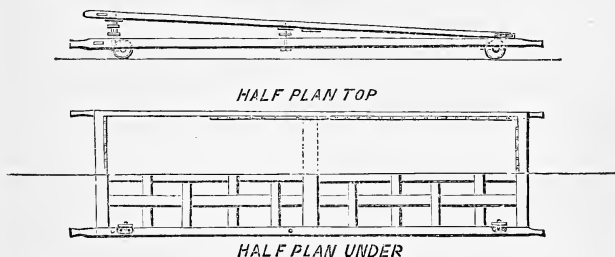


FIG. 33.

quite ascertained that it is fully supported by No. 3 bearer. When this is known to be accomplished, the first bearer turns round, supporting the left pole at the side as he does so, and then, acting in concert with No. 3 bearer, raises the ends of the poles, which are now free, into the compartment of the wagon destined to receive them.

The bearer at the head of the stretcher takes care at the same time to maintain it level, and assists, by pushing it forwards, in effecting its entrance into the wagon. With this system the admission of the stretcher is effected with ease, rapidity, and security, while two bearers can only

accomplish the object with difficulty, and not without risk of accident to the patient.

The other stretcher is loaded and introduced in the same manner. Next, three patients are placed sitting on the seat behind, and two with an attendant on the seat in front, which is mounted by a ladder, carried for the purpose, attached to the side of the wagon.

In unloading, the sitting patients are first to be removed, and afterwards the stretchers with the lying down patients. The same care should be exercised in removing the stretchers from the wagon as when inserting them.

CHAPTER X.

TRANSPORT OF SICK AND WOUNDED IN THE RECUMBENT POSITION BY RAILWAY.

THE carriages on British railways which may be made use of for this purpose are,—invalid carriages, specially constructed, second-class passenger carriages, and goods wagons.

INVALID CARRIAGES.

A carriage of this kind is now being constructed at the Metropolitan Works, Birmingham, intended to convey such invalids as require the recumbent position from Portsmouth to Netley Hospital. It is designed to carry eight patients, lying on ambulance-wagon stretchers placed in bunks. The bunks are arranged in two tiers, one above the other, along the sides of the carriage, thus leaving a passage in the centre. The doors of entrance are on the sides at one end. There is also a door of communication in each end of the carriage. It contains a water-closet, lavatory, water-tank, and other conveniences, also medicines and medical comforts.

Directions for Loading.—Three bearers at least will be needed for this purpose. The bearers place the patient on an ambulance-wagon stretcher according to the directions already given, and carry it through the side door of the carriage, and along the central passage until it is

brought side-on to the bunk in which it is intended to be placed. The sideboard being previously let down, and the slides drawn out, the stretcher is placed on the slides and pushed sideways into the bunk. The sideboard should then be raised and secured in its place by the bolts provided for the purpose.

Patients are placed in the other bunks in a similar manner.

Directions for Unloading.—The sideboards of the bunks being let down, one bearer places himself opposite the head of the bunk, the other at the foot. Then both seizing the stretcher draw it out of the bunk sideways, at the same time moving round to the end and taking hold of the handles. The stretcher being freed from the bunk and slides is carried down the passage, turning to the right or left as the case may be, and out of the carriage on to the platform. The stretcher may then be introduced into an ambulance wagon for further transport without removing the patient.

In cold weather each stretcher should be provided with a blanket and a rug. A pillow in addition to that on the stretcher would add much to the comfort of the patients.

SECOND-CLASS RAILWAY CARRIAGE.

The large second-class railway carriages are those suited for transport purposes. Each compartment has a length from side to side of about 7 ft. 6 in., and a breadth from the back of one seat to the back of the other of about 4 ft. 10 in., with a door of about 1 ft. 10 in. in width.

Two cross supports are placed upon the opposite seats, and two ambulance wagon stretchers with patients placed upon these, leaving a space between on which one or two attendants can sit.

The cross supports are of wood, four feet eight inches long, six inches broad, and an inch and a half thick; a centre block and two side blocks are nailed on one side, leaving two gaps, into each of which the side pole of one stretcher fits. (See fig. 34.)



FIG. 34.—Cross support.

Directions for Loading.—Three bearers are required for this purpose. The two cross supports are placed on the seats of the compartment, each about a foot from the door. The door is held open to its full extent. Should the guard strap not be sufficiently long to allow the door to open to its full extent, it will have to be undone at one end, either by drawing the nails or peg with which it is fastened. The bearers place the patient on an ambulance wagon stretcher in the usual way, and carry the stretcher end on to the doorway. No. 3 bearer gets inside the compartment and takes hold of one handle of the stretcher, while No. 1 moves round the other handle to the side, and in this way the handles are inserted through the doorway. No. 3 now takes hold of the other handle from No. 1, which leaves No. 1 free to assist No. 2. The stretcher is thus carried along to the opposite side of the compartment, when No. 3 lifts his end over towards its place, and resting it on the cross supports, gets to the side of the stretcher. The stretcher is next lifted completely within the compartment and placed in its proper position, close up to the side or partition of the compartment, resting over the seat. The second stretcher is inserted in the same manner.

An attendant sits upon one of the cross supports between the two stretchers to take charge of the patients on the journey.

Directions for Unloading.—The carriage being alongside the platform, the door is held open to its full extent. Nos. 1 and 2 bearers go inside the compartment, and take up a

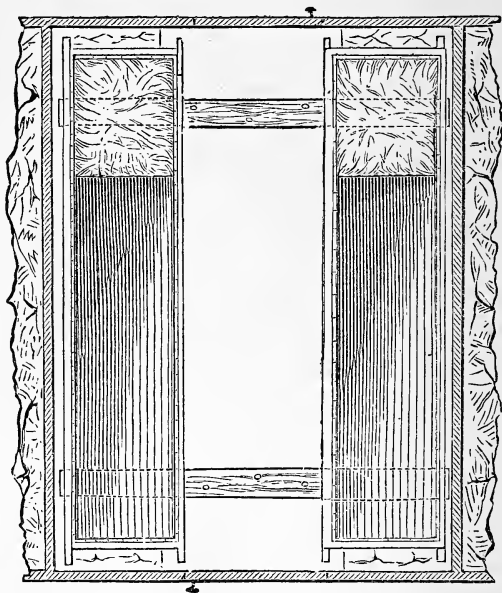


FIG. 35.—Compartment of railway carriage, showing arrangement of stretchers.

position one opposite each end of the stretcher. Both, reaching over, lay hold of the handles and lift the stretcher out of its place towards the centre of the compartment, resting it on the cross supports. No. 1 descends to the platform, and with the aid of No. 3 withdraws the end of the stretcher through the doorway, No. 2 in the compartment carrying the other end. When the latter has reached the door, No. 3 comes to his assistance, and each taking hold of one handle, pass it through the doorway.

The stretcher may now, without removing the patient,

be placed in an ambulance wagon or on a wheeled support for further transport.

GOODS WAGONS AND CATTLE TRUCKS.

To render goods wagons and cattle trucks available for the transport of sick and wounded, a simple method has been devised in Germany. Four springs and two poles are required for each set of stretchers. The springs are of steel, and semi-elliptic in shape. A foot is placed at one end of the spring furnished with three or four projecting spikes, and at the other end is a roller. On the top of the spring is a crutch, into which one end of the pole fits. The poles are as long as the breadth of the wagon.

Directions for Loading.—Two springs are placed, one at each side of the wagon, and fixed by driving the spikes projecting from the feet into the floor. This done, a pole, laid crosswise as to the wagon, is fixed at either end into the crutches on the springs. Two other springs and another pole are similarly placed at a distance of about six feet. Stretchers of any kind with patients upon them are then carried in the ordinary way, and laid on the poles in the direction of the length of the wagon.

A wagon is broad enough to admit three stretchers thus placed, but it is seldom sufficiently long to allow of two rows; so that three patients only can be carried in each wagon. The stretchers should be so placed that they will not come in contact with the sides of the wagon.

APPENDIX.

THE USES AND MANAGEMENT OF THE FIELD HOSPITAL EQUIPMENT OF THE BRITISH ARMY.

LIST of field hospital equipment for the use of a regiment
of cavalry or infantry on active service in the field.†

Article.	No.	Remarks.
Ambulance wagon, with } harness, &c., complete }	1	Fitted up with basket for knapsacks, and straps for arms, and capable of carrying 2 men lying and 6 sitting
Stretchers or hospital bearers	14* }	2, at least, of the stretchers should be conveyed in the ambulance wagon
Light operating table	1 }	Conveyed outside the wagon
Water barrel	1 }	
Water bucket	1 }	
Medical store cart, with har- ness, &c., complete	1	
Canteens, A, new pattern ...	1	The medical comfort boxes and can- teen boxes are each 2 ft. 6½ in. long by 1 ft. 1 in. wide; the box for fracture and dislocation apparatus the same width, but double the length, viz., 5 ft. 1 in. The 5 boxes fit, and are conveyed in, the body of the cart
do, B, do. ...	1	
Medical comfort { Wines ...	1	
boxes { Groceries	1	
Box of fracture and disloca- tion apparatus	1	
Marquee, complete	1	These articles are conveyed in the hospital cart, on the top of the boxes
Bell tent, complete	1	
Bags of bedding	4	
Water buckets	2	
Reaping hooks	6*	These articles are conveyed outside the hospital cart
Spade	1	
Pickaxe, 5 lbs.	1	
Saw, hand, 26 inches	1	
Axe, 4½ lbs.	1	
Billhook	1	

*† For Cavalry, no detachment medicine chest is issued, and only 5 reaping hooks, 10 stretchers, 1 field companion, 1 stomach pump, and 1 set each of cupping, post-mortem, and tooth instruments.

† War Office Circular, 856.

List of field hospital equipment, &c. (*continued*)—

Article.	No.	Remarks.
Regimental medicine chest	1 }	The chests will be left in store at the base of active operations, or in such other place as may be determined on by the Medical Officer
Detachment do.	1* }	
Medical panniers, pairs } with pack saddles, &c., }	1	Will be in charge of the Hospital Serjeant, and conveyed by mule
complete		
Field companions	2*	To be carried by the Hospital Servants
Stomach pumps	2* }	These articles should be placed either in the panniers or in the book and instrument box, as the Medical Officer may deem best
Cupping instruments	2* }	
Post-mortem do.	2* }	
Tooth do.	2* }	
Detachment case of instruments	1 }	To be left with the medicine chests in store at the base of operations or other eligible place
Box for books and surgical instruments	1	

MEDICAL STORE-CART.

The medical store-cart is a two wheeled vehicle, drawn by two horses, the old pattern, without springs, the new pattern, with springs. (See fig. 36.)

DIRECTIONS FOR PACKING THE MEDICAL STORE-CART.

Place A and B canteens on the floor of the cart on the left hand side, Nos. 1 and 2 medical comfort boxes on the right, and slide the box of fracture and dislocation apparatus into the space between the canteens and comfort boxes. Put on and fasten the tailboard.

On top of the boxes place the four bags of bedding, the bottoms of the bags to be towards the front and rear of the cart. Place the marquee in a central position longitudinally

in the same direction, and above the bags of bedding as far forwards as will throw sufficient weights upon the

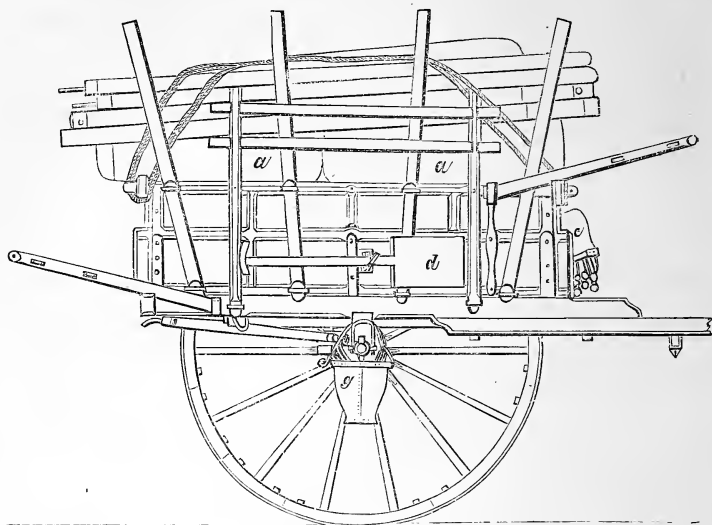


FIG. 36.—*Contents.*

IN THE BODY OF THE CART.

- 1 canteen A.
- 1 do. B.
- 1 medical comfort box.
- 1 do. do. wines.
- 1 box for fracture and dislocation apparatus.

ON TOP OF CART.

- (a) 4 bags of bedding.
- (b) 1 hospital marquee.
- 1 bell tent.

ON OUTSIDE OF CART.

- (c) 6 reaping hooks.
- (d) 1 spade.
- (e) 1 pickaxe.
- 1 saw.
- (f) 1 axe.
- (g) 2 water buckets.

Cart with 5 feet wheels, ladders, &c., complete.

shafts and balance the cart. Behind the marquee place the bell tent and peg bag of marquee.

Fix the hoops in their places, and in the space between them and the marquee and tent, slide in the poles. Next put on the waterproof cover, and having placed the water-

proof flooring, two pieces on each side, between the hoops and the side rails, lash the whole tightly with the rope.

The water buckets are carried slung from the axletree, the pickaxe under the back part of the body of the cart, the spade on the right side, and the billhook, axe, saw, and reaping hooks on the front of the cart, secured by straps.

List of the number and description of articles contained in the new pattern canteen of hospital utensils for field equipment, approved 14th June, 1861, $\frac{7530}{88}$, with directions for packing same.

(To be issued to Cavalry and Infantry Regiments.)

No. of Articles.	Description of Articles.
<i>Contents of Box A.</i>	
25	Cups, drinking, tin, 1 pint.
25	Plates, dinner, tin.
25	Spoons, table, hospital pattern
1	Spoon, gravy, "
25	Knives, dinner, "
25	Forks, dinner, "
1	Knife, carving, "
1	Fork, "
1	Fork, flesh, small, "
1	Ladle, soup, pint, "
1	Dish, meat, tin, 13½ inch, hospital pattern.
1	Shape, pudding, tin, quart.
8	Saucepans with cover (to nest), 1 pint to 12 quarts.
1	Infuser, tea, with tripod stand and moveable perforated box.
1	Triangle, with tubular joints, and chain with hook attached.
2	Straps, black leather.
1	Box (A).
1	Padlock, iron, small, with key.
Total weight of contents, including box, 112½ lbs.	
Weight of box, without contents, 31½ lbs.	
Length of Box, 31 inches; width, 14 inches;	
Depth, 15 inches; bulk, 3·83 cubic feet.	

DIRECTIONS FOR PACKING CONTENTS OF BOX A.

- 1 triangle at bottom, front right hand.
- 2 tin cups in the innermost or smallest of the nest of saucepans.
- 8 saucepans to nest with covers, left hand.
- 25 dinner knives in 2 parcels, 1 in each corner at end, left hand close to saucepans.
- 1 pudding shape, 3 tin plates, and cover for tea infuser, to nest in meat dish, $13\frac{1}{2}$ in.
- 1 meat dish, $13\frac{1}{2}$ in., with contents, in centre at back, close to nest of saucepans.
- 25 table spoons in 5 parcels, 25 dinner forks in 2 parcels, and 5 drinking cups (reversed), in tea infuser.
- 1 tea infuser with contents, right hand corner at back.
- 1 gravy spoon, and 1 flesh fork, in front, resting on triangle.
- 1 carving fork, in front, left hand corner.
- 7 drinking cups (nested), to rest on their sides in bottom of box.
- 6 drinking cups (nested), to rest on their sides in bottom of box.
- 22 tin plates (nested), on edges, in centre, close to meat dish, $13\frac{1}{2}$ inches.
- 5 drinking cups, in front, in space to left of tea infuser.
- 1 carving knife, in front, at top, resting on tea infuser.
- 1 soup ladle, in right hand corner, between tea infuser and front corner box.
- 2 black leather straps, on top, right hand.

List of the number and description of articles contained in the new pattern canteen of hospital utensils for field equipment, approved 14th June, 1861, $\frac{7530}{88}$, with directions for packing same.

(To be issued to Cavalry and Infantry Regiments.)

No. of Articles.	Description of Articles.
<i>Contents of Box B.</i>	
2	Basins, wash hand, zinc, 9 inch.
12	Towels, hand, hospital pattern.
2	Candlesticks, iron, galvanized.
1	Pair snuffers, common.
2	Burners, double wick.
2 lbs.	Wick, cotton (to suit burners).
1	Pair scissors, lamp.
1	Lamp, hand, with patent glass sides.
1	Lantern, coloured glass.
1	Bottle, oil, tin, 2 quarts, with screw top.

List of articles in the new pattern canteen of hospital utensils for field equipment, &c. (*continued*)—

No. of Articles.	Description of Articles.
2	Close stools, field service, complete, consisting of— 2 zinc pans, 2 triangles, 2 tin lids or covers, 2 ring tops. 6 legs, tubular, iron,
3	Urinals, pewter or zinc.
4	Chambers, zinc.
3	Cups, spitting, zinc.
1	Set of tin scoop, and weight scales, with beam, to weigh from $\frac{1}{4}$ oz. to 7 lbs., complete, with 4 brass and 5 iron weights.
3	Pieces, sponge, $\frac{3}{4}$ oz.
3	Flannel, yards, 27 inch.
1	Packet of needles, containing 2 packing, 25 darning, and 25 sewing needles, No. 6, and 25, No. 7.
50	Buttons, metal.
2	Thread, white, ozs.
2	,, ,, whited-brown, ozs.
8	,, worsted, blue grey, ozs.
2	,, cotton, darning, ozs.
1	Fryingpan, 12 inch, with shifting handle
1	Saw, meat, 14 inch, hospital pattern.
1	Chopper, ,, "
1	Hammer, claw, small.
1	Chisel, Ripping, 1 inch.
2	Porringers, blood, tin.
1	Bed, pan, zinc.
2	Matches, tin boxes of.
2	Straps, black, leather.
1	Box (B).
1	Padlock, iron, small, with key.
Total weight of contents, including box, 113 lbs Weight of box, without contents, 31 $\frac{1}{4}$ lbs. Size, &c., same as Box A.	

DIRECTIONS FOR PACKING CONTENTS OF BOX B.

5 iron weights, viz., 4 lb., 2 lb., 1 lb., $\frac{1}{2}$ lb., and $\frac{1}{4}$ lb., at bottom left hand, secured by battens.

6 legs for close stools, 1 hammer, 1 chopper, 1 saw, 1 ripping chisel, and 1 handle for fryingpan, distributed at bottom, right hand.

(A sheet of strong paper to cover the foregoing articles.)

2 triangles, close stool, close to back, in centre, to rest on their base.

1 frying pan, 2 rings, close stool, to nest in 2 tin covers, for stool, right hand.

- 3 pieces of sponge, 50 buttons, 4 brass weights (viz., 2 oz., 1 oz., $\frac{1}{2}$ oz., and $\frac{1}{4}$ oz.), 3 balls of cotton wick, and 1 handle of pan, all in interior of bed pan.
 1 bed pan, with foregoing contents, right hand, over close stool.
 2 close stool pans, 4 chambers, 1 spitting cup (nested), reversed, at bottom.
 2 urinals, in centre.
 1 urinal, left hand.
 2 candlesticks, on edge, left hand, close to end, balls of cotton wick to be fitted into the spaces round bed pan and candlestick, left hand.
 1 beam, for scale pans, on edge, at back.
 4 oz. thread (white and whited brown), 2 oz. cotton, 1 packet of needles in tin scale pans.
 2 tin scale pans, with foregoing contents, in centre, from front to back.
 2 burners, 1 on each side of close stool pan.
 2 towels, front, right hand.
 8 towels, centre, right hand.
 2 boxes of matches, in the interior of coloured glass lantern.
 1 coloured glass lantern, with contents, to rest on 2 towels, front, right hand.
 2 towels, over lens of coloured glass lantern as a protection.
 3 yards of flannel, spread over 2 tin scale pans and contents.
 1 lamp stand, in centre at back, to rest on flannels.
 1 can with oil, 2 quarts, left hand from back to front, base at back.
 2 tin porringers, left hand, in front of oil can, bottoms to front of box.
 1 pair lamp scissors, 1 pair snuffers, in 2 wash-hand basins.
 2 wash-hand basins, with contents, between oil can and hand lamp.
 8 oz. worsted, on top, in front of hand lamp.
 2 black leather straps, at top.
 1 cup, spitting, zinc, between oil can and wash-hand basin.
 1 cup, ditto, ditto, turned upside down on wash-hand basin, in middle of leather straps.

MEDICAL COMFORT BOXES.

Contents of Battalion Box No. 1.—Wines, &c.

Port Wine, 1 gallon, in 6 bottles	}	in compartments at each end of box.
Brandy		
Essence of beef '20 lbs., in $\frac{1}{4}$ lb. tins—5 in stationery tin case, and 75 in vacant compartment (<i>vide</i> plan).		
Stationery, &c., in tin case, $4\frac{3}{4} \times 6 \times 11$ inches, containing,—		
Blotting paper	12	sheets.
Post paper	10	quires.
Quill pens	25	
Steel pens	2	boxes.
Pencils	4	
Wafers	1	box.
Penknife	1	
India rubber	1	piece.
Ink glasses (square fountains)	2	
Ink powders (black)	2	
Envelopes, 100 No. 1, 100 No. 2, and 100 No. 6.		

Forms of requisitions for comforts, &c.

Weight of No. 1 box, when full, 124 lbs.; empty, 47 lbs.

Contents of Battalion Box No. 2.—Groceries.

Articles.	Quantities.	Description, size, &c., of Tin.	Position in Box.
		Divided in middle by partition.	
1. Candles	8 lbs.	4" × 6" × 12"	} All these tins are the same width and depth as the medical comfort box, and stand in order as numbered (see plan).
2. Tea	5 ,,	4½" × 6" × 12½"	
3. Vegetables, pre- served, mixed }	5 ,,	2¾" × 6" × 12½"	
4. Arrowroot	14 ,,	4¾" × 6" × 12½"	
5. Soap	5 ,,	6¼" × 2½" × 11"	} Next No. 4 at bottom of box.
6. Mustard	1 lb.	4" × 3" × 11"	
7. Pepper	2 lbs.	2¼" × 3" × 11"	} On top of No. 5.
8. Sugar	10 ,,	6¼" × 6" × 11"	
9. Salt	5 ,,	4¾" × 6" × 11"	} Next Nos. 5, 6, and 7, at right end of box.
10. Measures, &c., as under*	4¾" × 6" × 11"	
			} On top of No. 9, and next to No. 3.

* Pint and ½ pint, gill and ½ gill measures, corkscrew, knife for opening tins, salt cellar, pepper castor, mustard pot and spoon, and 5 boxes of matches for infantry, 4 for cavalry.

Between and on the top of the tins, 1 quire of small cap, 1 quire of medicine paper, and a few forms of assistant Steward's store accounts.

Weight of No. 2 box, full, 120 lbs.; empty, 63 lbs.

External length of medical comfort boxes, 32½ inches; breadth, 13½ depth, 15½; bulk, 4 cubic feet.

BAGS OF BEDDING.

Contents of a Bag of Bedding for Field Hospital.

No. of Articles.	Description of Articles.
5	Blankets, hospital (or grey).
5	Paillasse cases, ,,
5	Bolster cases, ,,
5	Sheets, pairs, ,,
5	Belts, cholera, flannel.
5	Covers, bed, waterproof, vulcanized.
1	Beds, cork, field service.
Total weight of bag and contents, 104 lbs.	

DIRECTIONS FOR PACKING BAG OF BEDDING.

Extend the cork bed, placing both straps (buckled into one) underneath. Lay thereon paillasses, extended at full length.

„ bolster cases and cholera belts over paillasses.

„ blankets and sheets, folded in four folds.

Lastly, cover over the whole with the waterproof bed covers, extended full length; turn over the flaps of the cork bed and tie them with twine by the rings to prevent them from extending in rolling.

Roll up the whole tightly, buckle on the strap, and put it into the bedding bag.

N.B.—The cork bed underneath, and waterproof covers on the top, preserve the bedding from damp.

The four bags of bedding are conveyed in the hospital cart, on the top of the medical comfort boxes.

HOSPITAL MARQUEE.

The hospital marquee, complete, consists of the following parts, viz.:—

1 inside linen roof	}	Packed in a canvas valise, laced up the centre, and marked on the outside "Hospital Marquee."
1 outside ditto		
8 walls (4 inside and 4 outside)		
82 bracing lines (40 inside and 42 outside), with wood runner and button to each		
2 wood vases, painted red		
2 weather lines (90 feet long each) with large runners	}	Contained in 1 pin bag, marked on the outside with contents and marquee to which it belongs.
180 small tent pins		
4 large ditto (for weather lines)		
2 mallets		
1 set of poles, consisting of 8 pieces, viz., 1 ridge in two pieces, and 3 standard or upright in two pieces	}	Lashed together in 1 bundle by two box cords.
1 waterproof bottom, made of painted canvas, in four pieces, each piece measuring 15 by 8 feet		
		Rolled in a bundle round a thin pole, and tied by three box cords.

DIRECTIONS FOR PITCHING, STRIKING, AND REPACKING THE HOSPITAL MARQUEE.

Pitching Marquee.—Undo and empty the peg bag, keeping the four large pegs for the weather lines by themselves, and place the handles in the mallets. This done, proceed to lay out the ground for pitching the marquee as follows —

Mark the spot for the centre standard pole by driving in a peg, and, at a distance of seven feet from each side of the spot so marked, drive in other pegs as marks for the end standard poles.

With each end peg as a centre describe a semicircle, having a radius of eighteen feet.

Draw a straight line on each side parallel with the pegs, marking the line of standard poles, and fifteen feet therefrom, with its ends opposite the ends of the semicircles.*

The ground being thus marked out proceed to drive in pegs round each semicircle for the gable ends or sweeps of the outer roof of the marquee, commencing with one peg in the centre, on a line with the pegs for the standard poles, and placing six pegs on each side of this centre peg at equal distances, the sixth peg on each side forming the end of the semicircle.

On the straight lines at the sides drive in six pegs, the first and last at eighteen inches from the ends of the line, the remainder at equal distances from these and from each other.

Midway between each two pegs, and on a line about one foot within them, drive other pegs to receive the lines from the inner roof of the marquee, omitting, however, the one between the third and fourth pegs on each straight line.

Lastly, drive in the four large pegs for the weather lines, at a distance of eighteen feet, in a straight line from each side of the centre pegs of the semicircle. (See fig. 37.)

The ground being thus laid out, unlace the valise, arrange the marquee one roof within the other, in such a manner that the base and ridge will be parallel with the line of the standard poles, and the ridge distant from that line the length of the poles.

* The lines should be marked by laying pegs with their points where they are to be driven in.

Roll the upper side of the outer roof as far as the ridge, so as to expose the web slings of the inner roof. Pass the

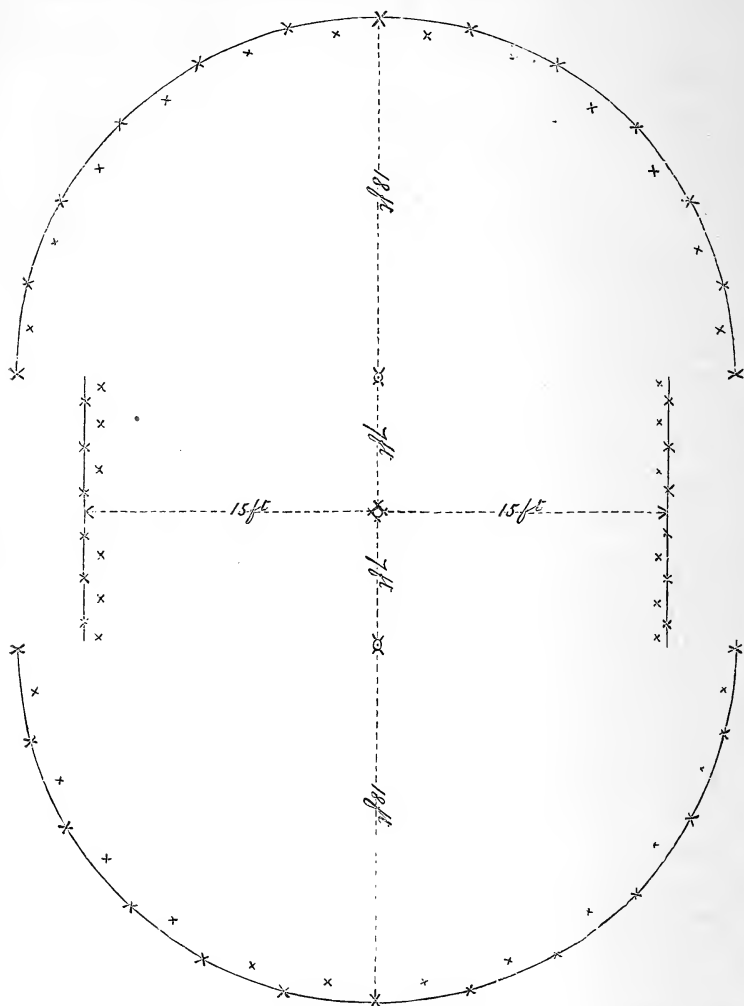


FIG. 37.

ridge pole through the web slings, bringing the peg holes to correspond with the peg holes of the slings, and thus form the support for the inner roof.

Care should be taken to have these slings properly arranged.

Fix the pieces of the standard poles together (each of these poles is in two pieces, which fit into each other by numbers).

Roll up the upper side of the inner roof as far as the bottom of the web slings.

Pass the standard poles through the openings at the ridge of the inner roof; next pass the pins of the standard poles through the holes of the ridge pole, and those of the *end* standards through the eyelet holes of the last web slings, and also through the eyelet holes at the ends of the ridge of the outer roof. Place the vases with weather lines on the pins of the end standards.

Pass the opening lines of the ventilators through the holes in the vases, and down through the holes in the ridge of the inner roof, by the side of the end standards. See that the lines for opening and closing the windows are in their proper places.

These need never be removed, but their ends should be knotted to prevent them drawing through.

Next roll down the inner and outer roofs to their original position.

The standard poles should now be raised carefully, steadily, and simultaneously, until they are perpendicular, and, to assist this operation, two men should haul on the weather lines on the side towards which the marquee is being raised.

The erection of the marquee is rendered much steadier by slipping the weather lines on the pegs, driven in for

their reception, as soon as the standard poles are raised to the perpendicular position.

The poles being raised, tighten the weather lines on each side, crossing them one over the other. Undo and attach the bracing lines of the outer roof to the pegs driven in for them, commencing with the lines at the sides of the windows, which should be put on the third and fourth pegs on the straight line at each side, and next attach the lines of the inner roof in like manner.

Hook on the walls to the roof, commencing with the outer wall at the gable end, and pin them down at the bottom by driving pegs through the loops provided for that purpose. The inner walls to be similarly treated.

Unroll and lay down the waterproof floorcloth.

Having thus pitched the marquee, dig a small trench round its outer wall to prevent water running inside should there be any rainfall. (See fig. 38.)

Striking Marquee.—First unfasten the walls at the bottom, and unhook them from the roof, unfasten the bracing lines and do them up into small skeins, commencing with those of the inner roof, all of which are to be first unfastened. Next treat the lines of the outer roof in a similar manner.

Loosen the weather lines on the side from which the marquee is to be lowered, then lower it gradually and steadily to the ground by means of the weather lines, while one or two men stand by each of the standards on the side towards which the marquee is being let down, to steady and prevent them falling to the ground too suddenly or unevenly, walking backwards under them as they are lowered, in the same way as men lower a ladder.

Repacking Marquee.—The marquee being struck, remove the vases and weather lines, the ridge and standard poles.

Next spread out the roofs doubled one within the other, the windows being exactly one over the other. Bring over each end to the centre so as to form an exact square, and fold the square thus made into three equal parts. When folded, the windows should appear in the centre of the roll.

Fold the eight pieces of the walls each into eight folds. Place them thus folded on the roofs lengthwise, overlapping in the centre, the buttons and skirts to be placed towards the thick end of the roofs. Place the vases and weather lines on top, at the thick end of the roofs and walls.

Roll up the whole thus placed evenly, commencing with the lower thick end, taking care not to have the roll either too large or too small for the valise.

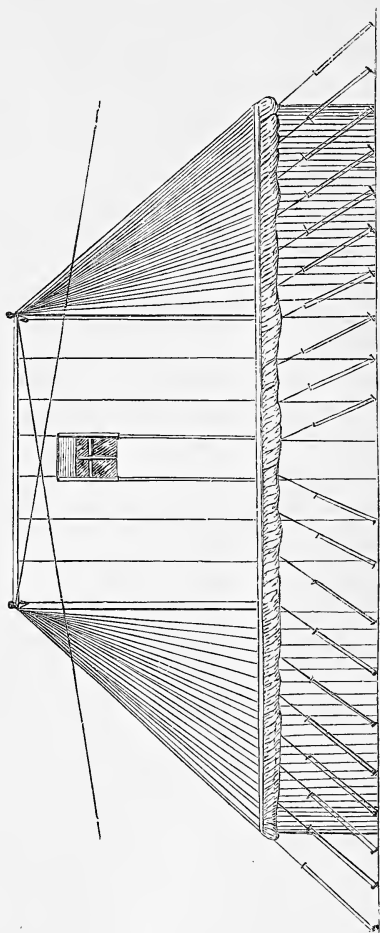


FIG. 38.

Place the whole in the valise, lace the valise, com-

mencing with the three longitudinal laces to keep it secure. Commence the outside lacing in the centre, lacing in each side from the centre towards the ends. Pass each end of the lace through the tab on other side of the valise, bring up again and fasten.

Collect the pegs, remove the handles from the mallets, and place all in the peg bag.

Take up and roll separately each piece of waterproof flooring.

The CIRCULAR LINEN TENT, complete, consists of—

- | | | |
|---|---|---|
| <p>1 circular roof, to which is attached a wall 13 inches deep; 22 bracing lines, with a runner and button to each, with 5 small ventilators at apex of roof; and 3 of Doyle's ventilators, equal distances apart, but placed 3 feet above the junction of roof with wall</p> <p>1 pin bag, containing 42 small pins, 2 mallets (marked on outside with contents and tent to which it belongs)</p> <p>1 pole, in two pieces</p> | } | <p>Packed in a valise, the roof at <i>bottom</i> and the pin bag at <i>top</i>, horizontally; the whole forming one compact package, marked outside "Circular Linen Tent, complete, with Pin Bag, Pins, and Mallets."</p> |
|---|---|---|
- Lashed together by 2 cords.

BOX OF FRACTURE AND DISLOCATION APPARATUS.

Contents.

- Iron double-inclined plane (modified M'Intyre's splint).
- Jointed and high splint.
- Two sets of japanned leg splints.
- Iron extension splint, as made by Mr. Matthews, of Portugal Street, for fracture of the humerus.
- Jointed elbow splint.
- Ellis's clavicle apparatus.
- Pistol-shaped splint for fracture of the lower end of the radius.
- Set of lined splints.
- Six pasteboard splints.
- 1 lb. gutta percha
- 4 yards gutta percha tissue
- Tin containing 2 lbs. of dextrine.
- Ditto ditto 1 lb. of plaster of Paris.
- 24 hand loom (loose weave) bandages for plaster of Paris bandage.
- Arm sling.
- Leg sling, new pattern.
- Dislocation apparatus.
- 1 lb. cotton wool.

HOSPITAL.—FIELD PANNIERS.

Dimensions of each pannier : Length, 2 feet 3 inches ; breadth, 1 foot 2 $\frac{1}{4}$ inches ; depth, 1 foot 4 $\frac{1}{2}$ inches.

The two panniers are constructed to form together a field operating table. Weight of straps for a pair of panniers, 5 $\frac{1}{4}$ lbs.

Contents of No. 1.

MEDICINES.		MATERIALS.	
	lbs. ozs.		
Ammoniaë sesquicarb.....	2	Corkscrew	No. 1
Antimon. potas.-tart.....	$\frac{1}{2}$	Knives (1 palate and 1	} Drawer No. 1.
Acid. sulphuric	2	pill)	2
Acid. nitric. pur.	2	Scissors	pair 1
Æther. chloric.	2	Blank labels	No. 100
Argenti nitrat.	1	India rubber enema ...	1
Blistering collodion	2	Grain scales and	} Drawer No. 2.
Chloroform (in three capped		weights	set 1
bottles)	9	Pens, ink, and wafers	
Collodion.....	1 $\frac{1}{2}$		
Cerat. cetacei	8		
Cupri sulphat.	1	Gallipots	doz. 1
Hydrarg. chlorid.	4	Pill boxes	nest 6
Hydrarg. nitrico-oxid.	$\frac{1}{4}$	Corks (vials and quarts) doz.	4
Ipecacuanhæ pulv.	1	Measures (2 oz. and	} Drawer No. 3.
Jalapæ pulv.	2	minim)	No. 2
Liquor stypticus	4	Graduated horn cap ...	1
Liq. ammoniaë acet. concent...	4	Pestle and mortar.....	1
Morphiæ acetat.....	$\frac{1}{2}$	Ligatures (silk and	} Drawer No. 4.
Ol. terebinthinæ	8	thread)	oz. 2
Ol. olivæ opt.....	4	Needles	doz. 1
Ol. tigllii	$\frac{1}{2}$	Wax	oz. $\frac{1}{4}$
Ol. menthæ pip.....	2	Tape (broad).....	piece 1
Opil. pulv.	2	Paper of pins	No. 1
Pil. colocynth. comp.	4	Packthread	ball 1
Pil. hydrarg.	4		
Pulv. ipecacuanha comp.	1	Surgeon's sponges ...	No. 6
Pulv. antimon. Jacobi	1	Wax matches	tin box 1
Pulv. cretæ. comp. c. opio. ...	8	Blotting book	No. 1
Plumbi acetat.	2	Extra slinging irons... ..	4
Quinæ disulph.	4		
Sodæ bicarb. pulv.....	2		
Spirit. ammoniaë aromat.	6	Paper	qr. $\frac{1}{2}$
Spirit. æther. nitrici	2	Oiled silk	yard $\frac{1}{2}$
Spirit. æther. comp.	2	Gutta percha tissue ...	12
Tinct. ferri sesquichlor.	4	Oiled paper (substitute	} Drawer No. 4. Drawer No. 3.
Tinct. Opil.....	8	for oiled silk).....	sheets 12
3 empty bottles for pills.			
2 bottles for brandy and water.			

Weight of No. 1, 90 lbs.

Surgeon's full set of surgical instruments and medical certificate book.

Lamp with reflector, which may be suspended by the moveable hooks at the back. By raising the cover on the top of the lamp, the small tin saucepan in the tourniquet case may be fixed there for the purpose of heating a little water for the preparation of tea, &c. The candle tube must always be lowered and fixed at the bottom of the lamp when lighted.

Contents of No. 2.

IN TIN CASE.

Field tourniquets.....	16
Screw ditto	4
Tin saucepan (for heating water over the lamp)	1
Small strainer (for making a cup of tea quickly and economically)	1

Place a teaspoonful of tea in the strainer, and pour boiling water upon it.

IN TIN CASE.

Lint	2½ lbs.
Carded cotton	2 „
Calico bandages	48

IN WALLET.

Linen sheeting	3 yds.
Calico	2 „
India rubber sheeting	2 „

IN TWO TIN CASES.

Emp. adhesivum, on calico	4 yds.
Isinglass plaster	4 „

Weight of No. 2, complete (except the case book and admission and discharge book), 90¼ lbs.

IN TIN CASE.

Wax candles (for use in the lamp, the other pannier and the candlesticks in the lid of the case)	26
Wax matches	2 boxes.

AT THE BOTTOM AND IN THE LID.

Splints.....	1 set.
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UNDER BANDAGES AND SHEETING.

Tin bed pan	1
Tin washing basin, fitting round the bed pan	1

IN TIN CASE.

Black tea	1 lb.
Lump sugar	2 „

IN TIN CASE, under the tourniquets.

Arrowroot.....	1 lb.
Concentrated beef tea	1 „
Cocoa milk (in ½ lbs.).....	1 „

IN LID.

Case book	1
Admission and discharge book...	1

PACK SADDLE.

The pack saddle is used for hospital purposes in carrying field panniers, letters, and cacolets. That now in use is the Royal Carriage Department pattern, a modification of the Otogo pack saddle.

The saddle, complete, consists of—

1 breeching.	1 pair saddle panels, stuff.
1 breast collar.	4 breeching, or breast straps.
1 crupper, with strap.	2 crupper straps.
2 girths, web.	1 wantie, web.

Weight 63 lbs.

MEDICAL FIELD COMPANION.

Contents of Medical Field Companion.

Medicines.		Appliances.	
*Mixture for diarrhoea and cholera		Calico rollers	2
Chloroform	2 oz.	Suspensory bandages	2
Tinct. Opii	2 oz.	Clavicle bandages	2
Sp. Ammon. Arom.	2 oz.	Strong calico	$\frac{1}{2}$ yard
Powders.		Linen sheeting	$\frac{1}{2}$ yard
Tin No.		Lint	$\frac{1}{4}$ lb.
1	{ Morphia acet. gr. $\frac{1}{2}$, plumbi. acet. gr. iv., pulv. acacia. gr. ii., in each powder	Gutta Percha tissue	$\frac{1}{4}$ yard
2	{ Antim. tart. gr. i., pulv. acacia gr. iij in each	Cotton wool	$\frac{1}{2}$ lb.
3	{ Calomel gr. iij, pulv. jacobii gr. v., pulv. ipecac. co. gr. xv. in each	Isinglass plaster	1 yard
4	Pulv. kino. co. Θ j. in each	Adhesive plaster	$\frac{1}{2}$ yard
5	{ Pulv. eretæ. co. c. opio Θ ij in each	Surgeons' sponges	2
6	Pulv. jalapæ. co. Θ ij. in ea.	„ needles	25
Pills.		Whited-brown thread	$\frac{1}{2}$ oz.
7	{ Calomel gr. j. Pulv. Opii gr. j. in each	Razor in case	1
8	{ Plumbi acet. gr. iij. Pulv. Opii gr. j. in each	Shaving soap	1 roll
9	{ Calomel gr. ij. Pil. Rhei Co. et. Pil Coloc Co. aa. gr. ij. in each	Screw Tourniquet	1
10	{ Camphor gr. iij. Pulv. Opii gr. ij. et Pulv. Cayenne gr. $\frac{1}{2}$ in each	Candle and wax matches ...	1
		Pins	$\frac{1}{2}$ paper
		Tape	1 piece
		Scissors	1 pair
		Minim measure	1
		Graduated horn cup	1

A tin water bottle is supplied with each companion.

Weight, complete, $11\frac{1}{4}$ lbs.

Dimensions:—Length, 13 in., Breadth, $6\frac{1}{4}$ in., Depth, $8\frac{1}{4}$ in.

* Ol. anisi, Ol. cajeputi, Ol. juniperi, aa. 5 i. ss. Ætheris, $\bar{3}$ ss. Liq. acid, Halleri, 3 ss., Tin. Cinnam. ad. $\bar{3}$ ij.

Dose.—Ten drops every quarter of an hour in a tablespoonful of water.

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